JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Gas Workers as Territorials.

IT could only be accounted as foolhardy on the part of anyone to make the attempt to define the limitations of the interests of the gas industry. The more one muses over them, the more intricate and infinite they become. We talk glibly of the technical part, of the commercial part, of the labour, and of the administration of the industry, as though they were parts of definite form and outline. They are, of course, nothing of the kind. They are merely nominal distinctions. As parts, they may be taken as starting-grounds for the consideration of the limitless character of the interests of the gas industry; but nothing more. We take the labour of the industry for example. From the collector and meter inspector to the main layer, from the machine fitter and pattern maker to the yard labourer, the men are in the direct pay of the gas industry; but that does not define the labour interests of the industry. There are countless numbers of other men in its indirect employ. And, further, regarding those in the direct employ of the industry, their interests are not confined to the walls of the works or by the gas connections beyond. Their interests extend to their homes, and to their positions as units of a great Empire and as citizens. The broadness of these interests enables us to call attention to a matter which we feel can be shown to be one in which the administrators and workers of the gas industry are immediately and jointly concerned—that is, the new Territorial Army scheme.

The success of the scheme—we say this emphatically, and without fear of refutation—depends more upon employers than on anyone else. Workers in these days cannot afford to forfeit their employment and earning power by even the claims of national duty; and it will be according to the measure of the facilities that employers offer willing men that the territorial army scheme will be made or marred. It is from the great industrial establishments of the country that the men of thew, the best men to form this army for the defence of hearth and home, can be recruited. The Gaslight and Coke Company—and particularly the Governor (Mr. Corbet Woodall) and the General Manager (Mr. D. Milne Watson)—have been among the first of large employers to give encouragement to their men, who are within the qualification limits, to show their loyal and public spirit by enlisting in the new territorial army. The encouragement has been of that material order which will ensure that loyalty and any serious pecuniary loss to the men shall be kept as wide asunder as possible, during the time that it will be necessary for the men to serve in camp, and to take the regulation course of musketry. The results of this encouragement are traced in the descriptive account on another page of the visit that a couple of companies of territorials, of fine physique and military bearing, paid last Thursday to Mr. Woodall's home at Chislehurst. They were all from Beckton; and they were men upon whom any employer could look with particular pride. The example in this matter of encouragement of the Directors and of the chief officers of the Gaslight and Coke Company is one which other employers of the vast army of labour in the gas industry might well emulate.

Work in the gas industry is a peaceful occupation; it may be held by some employers that with such a peaceful occupation preparedness for war and defence is out of harmony. Defence does not spell offence; and complete defences and preparedness for anything that may come along is one of the best protections of peace, and the best assurance of its continuance. But we might, were it necessary to do so, appeal from national to social—aye, and even to selfish—grounds in favour of encouragement being given to men to join the citizen army. Among some of the best men that we have met in gas-works have been those who have served in the ranks of the national services; and who among us has not seen the shabby, slouching corner man raised to states of discipline, good character, smartness, and efficiency by enlistment in the regular army? The results in the ranks of the workers from training in the Territorial Army will in measure follow the same courses. Discipline, character, smartness, and efficiency will soon assert themselves, as the results, with greater effect by the healthy, agreeable, and rational—practical and recreative—work and new life that this will open up to the men; and it will also help to expand their powers of mind and body. Men who, being within the qualification limits, are willing, after the labour of the day is over, to fit themselves for service in defence of country and home, are men of the right stuff, and are of the best of workers, no matter the occupation, or the industry in which that occupation is centred. We hope that what has been said here has clearly shown that, even in this Territorial Army scheme, the interests of employed and employee have union—not only as fellow-countrymen, but in the best of all works—human betterment, from which generously flows advantage to all.

Professional Intercourse.

As we ventured to prognosticate would be the case, the visit of a considerable party of the members of the Institution of Gas Engineers to Berlin proved an unbounded success. They have been; they have seen; and they have been the objects of kindness and recipients of hospitality which, though it may be equalled, could not be excelled in bountifulness. They retain in memory a feast of technical interest; and a feast of the sweets of professional fraternity. It was indeed for all of the participants a very memorable visit; and our Special Representative, faithful to his commission, informs us that words cannot exaggerate the warmth of reception and treatment, from entry into and departure from Berlin, on the part of the Council and members of the German Association and of the representatives of the Imperial Continental Gas Association. The list of names that our representative includes in his account of the visit shows that many of the men of note in the German gas industry—men whose names are as household words among British gas engineers—were there to do honour to their visitors. Personal association over the four days spent in Berlin must in future greatly enhance the interest in the work of those *savants* and engineers of repute who have made the German gas industry the field for notable deeds and accomplishments. Need we do more than mention such names as Bunte, Körting, Oechelhaeuser, and Bueb?

It has been remarked before in these columns that the gas industry in its technical work knows no national bounds; and the greater the friendly intercourse between the workers of the industry of all nations, the better for progress. They have common ground on which to operate; and there is but one objective. Therefore we hope to see more of the intercommunication and of the outer reciprocal manifestations of friendly relationship that are marking this year between the gas professions of this and neighbouring countries. The visit to Germany was a profitable one; we hope that our French visitors who (as will be seen elsewhere) were welcomed in London yesterday will find their visit equally as enjoyable and profitable. The cynosure of the visitors to Berlin was the vertical retort-settings on the Dessau system; during the stay of our French visitors in this country, they will see the success that has attended the work along the difficult road to continuous carbonization in vertical retorts, by the aid of mechanical coal-feeding and coke-extracting devices. In Berlin, too, British gas engineers saw the stately gas-works at Mariendorf; and in the Tegel Gas-Works the ideals of the Chief Gas Engineer of the Berlin Municipality. They also saw how high-pressure gas lighting is in the ascendant in the lighting of the main thoroughfares of the city. Reverting to the Dessau vertical retort system, there have been occasional references in these

columns to an experiment that Herr Körting is trying at Mariendorf, with a bed of vertical retorts of much greater girth than those hitherto erected, and carrying charges of 1 ton 6 cwt.; but our representative reports that so far the results have not been equal to those of the retorts of smaller sectional dimensions.

We cannot conclude this little appreciation without an acknowledgment of the manner in which the elected heads of the Institution performed their parts during the visit to Berlin. The right words were uttered, and the right action was taken in the right place, by the President (Mr. W. Doig Gibb), the incoming (and now) President (Mr. Thomas Glover), the Vice-Presidents (Mr. James W. Helps and Mr. Alex. Wilson), and last, but by no means least, by the Hon. Secretary (Mr. S. Y. Shoubridge). From Berlin, the new President (Mr. Glover) and the Senior Vice-President (Mr. Helps) travelled to Paris to be present at the sittings last week of the Société Technique—returning to London on Friday, in good time to take part in the reception of the French visitors here. Thus the year for intercommunication between the leading gas organizations of the three countries has been unexampled. Long may this evidence of good fellowship and mutual interest continue, and by natural impulse. Insulation in technical gas work in the various countries of the world has, it may be asserted, been wiped away completely by the events of the opening years of the new century.

The German Association Meeting.

THE unfortunate coincidence, in point of time, of this year's meetings of the Institution of Gas Engineers and the kindred body in Germany, seems likely to hinder English gas men realizing to the full the importance of the technical matter dealt with at the sessions of the German Association in Berlin. Coming to publication in last week's "JOURNAL," along with the proceedings at the meeting of the Institution, the valuable contributions of the Engineers of the Zurich and Munich gas undertakings, on their experiences with vertical retorts and large carbonizing chambers, will be liable to escape the attention they deserve. It may, therefore, be appropriate to suggest that, after reading Mr. E. Körting's remarks, given on another page of to-day's "JOURNAL," those of our readers who omitted to study the papers of Herr Weiss and Herr Ries last week should turn back to them. They will then, with the figures from Dr. Bunte's report on the vertical-retort trials at Mariendorf and Zurich quoted at the meeting of the Institution by Dr. Colman (*ante*, pp. 813, 846, and 848), have before them the substance of the rich supply of information on the achievements of new Continental coal carbonizers which was laid before their German colleagues at the Berlin meeting.

Mr. Körting's paper should be of extreme service in directing attention to the points which are of real importance in the economy of coal carbonization, as distinguished from others, which loom largely in the eyes of the works superintendent but are really of minor significance. The warning which his paper gives—that the incidence of heavy capital outlay far outweighs the comparatively small achievements which now remain possible in the saving of labour—comes appositely from Germany, where capital expenditure has been particularly lavish of late in all new or reconstructed gas-works. Mr. Körting's figures, naturally, apply to expenditure on carbonizing plant proper only, and not on plant for the transport and the handling of coal and coke. They should, however, help to a proper appreciation of the directions in which any appreciable economy in the cost of carbonizing coal is possible, if only in that they compel attention to the fact that the comparisons of cost should be made on the basis of unit-volume of gas produced and not of unit-weight of coal carbonized. It is of the utmost importance at the present time to realize that even a great increase in the make of gas per ton of coal may be too dearly bought—owing to disproportionately great expenditure on plant and fuel. In this respect, it is still too early to pronounce with certainty on the relative merits of the two chief types of modern carbonizers on the Continent—viz., the Dessau vertical retort, and the Munich carbonizing chamber. They are now under comparison at the Hamburg Gas-Works, where English coal mainly is carbonized; and the figures brought before the Berlin meeting by Professor Drehschmidt in regard to their achievements under similar conditions, while very instructive, need the support of the results of extended trial. The all-important items of capital outlay and wear and tear have not yet, for obvious reasons, been taken into account in the comparisons. One fact which stood out prominently in the papers and discussion at Berlin was the general acceptance of the principle of filling the retort or chamber as completely as possible with the coal to be carbonized. There is no doubt that the practice has marked advantages, apart from the effect which it has on the character of the coke produced, and attempts to follow it as far as is possible with horizontal retorts have been made in many gas-works in this country with, if report speaks truly, conspicuously good results.

Apart from the new carbonizers, the points of interest to gas men in the Berlin meeting were the high-pressure street lighting, and the appliances for the handling and transport of coal and coke at the Tegel and Mariendorf works in that city. The latter appliances had already been fully described in the "JOURNAL" by the Constructing Engineer responsible for their erection; but it needed a visit to the works for the full realization of the smoothness and the thoroughness with which they fulfilled their purpose. The street lighting by means of high-pressure inverted burners seems to be almost insusceptible of any further improvement so far as gas is concerned, and constitutes an ideal towards which electric lighting engineers may strive, with, however, little hope of emulating its efficiency and economy. The reports of the Technical Committees of the German Association again furnished a record of much useful work carried out in an unobtrusive fashion. Perhaps the most striking contribution afforded by any one of them at the moment was the report from the Committee in charge of the experimental gas-works of the Association, dealing with the trials made under its auspices of the vertical retorts at Mariendorf and Zurich, which formed a fitting complement to its report last year on the trials of the Munich carbonizing chambers.

For the rest, the attendance of members and guests at the Berlin meeting was fully up to the average of recent years; and the social functions and festivities were carried through with the customary vigour and success. It is a tribute to the general organization of the German Association that, with a new Local Committee each year in charge of the arrangements for the annual meeting, there is never a hitch or suspicion of failure in their execution. Bearing in mind that over 1200 persons have to be accommodated at the various functions, one cannot but offer a tribute of hearty praise to the responsible officers and committee men.

The Meeting of the Société Technique.

THE Thirty-Fifth Annual Congress of the Société Technique du Gaz en France last week brought to a close the series of conferences of gas engineers which have been held during the past fortnight. By a singular coincidence, they took place in the capital cities of the three countries immediately concerned. English gas engineers met in London, those of Germany in Berlin, and our neighbours of France in their much-beloved Paris. It was perhaps regrettable that the London and Berlin meetings were being held simultaneously; but this did not prevent a number of English gas engineers from conferring in an informal and fraternal way with their German colleagues, inspecting some of their gas-works, and enjoying their hospitality. Those who were still desirous of extending their professional tour could have made their way round to Paris—as their President and first Vice-President (Messrs. Thomas Glover and James W. Helps) had to do, in their capacity as the English members of the Commission on the International Unification of Screw-Threads—and have listened to, at all events, a portion of the proceedings of the French Society, which were of a very varied and in several respects interesting character. In England and in Germany, about half-a-dozen papers generally suffice to fill the programme. That prepared for the meeting of the Société Technique, however, contained no less than thirty. But a number of them were of minor importance. In addition to the papers, however, there was a lecture, illustrated by lantern slides; and the subjects of vertical retorts, diffusion phenomena in flames, and the removal of naphthalene were discussed. Looking at the records of the proceedings at the three meetings to be found in the present issue of the "JOURNAL" and its immediate predecessor, it will be seen that from three of the principal capital cities of Europe there has lately gone up the cry of the German philosopher for "more "light" on questions which closely concern the greatest industry engaged in its provision. If the general body of engineers the world over wish for evidence of activity on the

part of their colleagues in the gas profession in Europe, we think these records may be confidently pointed to as amply furnishing it.

The meetings of the English and German Associations having been dealt with elsewhere, we are now concerned only with that of the Société Technique. At this gathering, which was presided over by M. Coze, of Rheims, the principal subjects brought before the members were connected with carbonization and distribution; and in the very forefront must be placed the lecture already referred to, which was by M. Marquisan, for some years Treasurer, and now a Vice-President, of the Society, on "New Methods and "Appliances for the Distillation of Coal for the Production of "Lighting Gas." M. Marquisan is not unknown to some of our readers, as he was present, as a delegate of the French Society, at the meeting of the Institution of Gas Engineers in Dublin last year, and has since visited England to personally investigate matters pertaining to his lecture, the subject of which he has thoroughly studied. It may be remembered that, with the view of enlightening his compatriots in the engineering profession on the progress of coal-carbonization methods, he delivered before the French Society of Civil Engineers early in the year an exhaustive lecture in which he described the various methods employed, including the latest types of vertical retorts. This lecture formed the basis of his discourse to the Société Technique; and as it was fully summarized in the "JOURNAL" for the 9th inst., our readers may be referred to it as furnishing an indication of the extent of the ground that was covered by M. Marquisan. Those who attentively listened to him for the two hours occupied by his discourse obtained, we are sure, a much fuller knowledge of the latest phases of the vertical retort question than they previously possessed. They had the advantage, too, of seeing the different systems illustrated upon the screen; and everybody recognizes the greater value, for purposes of instruction, of what is conveyed to the mind through the medium of the eye, compared with that which is conveyed orally. For M. Marquisan's work in the direction indicated, his colleagues in both Societies owe him their most cordial thanks. Though much of what he brought under their notice had appeared in our own columns and elsewhere, it was presented with such consecutiveness as to enable them to follow easily the evolution of the new system. In connection with this subject, the members had before them a valuable paper by M. Freyss, giving results of trials made by him in association with M. Cesari, under instructions from the Compagnie l'Union des Gaz, with vertical retorts in the gas-works at Dessau and Oberspree. This paper and others will be noticed further in subsequent issues.

Dealing as it does with an important branch of carbonization, attention may be directed to a paper by M. Guillet on the utilization of the ammoniacal liquor produced in small gas-works, and that by MM. P. et L. Chevalet on the production of naphthalene in the hydraulic main. A full abstract of the latter appears elsewhere. M. Guillet proposed two solutions of the problem presented, one of which is to produce a liquor which might, by means of the process described, be rendered suitable for agricultural purposes; the other to produce it in the form of sludge which could be transported to a distance and be dealt with by being treated with sulphuric acid in the works of the purchasers. The paper will furnish useful information to managers of small works who experience difficulty in disposing of their ammoniacal liquor. In the other paper alluded to, the authors show how, by the aid of a modification of the washer-condenser bearing their name, naphthalene may be retained in the hydraulic main. Anthracene oil, as recommended by Dr. Bueb, has been tried with good effect in a Chevalet apparatus; and the results are given in the paper. In connection with the treatment of gas after it has passed the condensers, attention may be directed to the record by M. Defoy of his experience in the removal of the cyanogen from the gas, by means of sulphate of iron, before it enters the oxide purifiers. Another paper given to-day deals with the carburation of gas by benzol.

It will be seen from the foregoing remarks that the members had presented to them for consideration, in the few papers noticed, subjects of much importance in the practical management of gas-works. In the domain of carbonization, the worth of the vertical system of setting retorts, compared with the inclined and horizontal methods, will, in the future, have to be appraised by managers whenever the question of extensions comes before them, and after the gas has been produced, their best attention must be given to its purification. The new departure which has been made by the Society in arranging for devoting a certain portion of the available time to the discussion of stated subjects, is an excellent one; and its development will, we think, be to the advantage of the members, even if the number of the communications has to be restricted, and some of the preliminary business curtailed by the distribution of the various reports in advance, and taking them as read. A large portion of the afternoon of the opening day is occupied in the distribution of the awards of premiums for papers, the Government medals for good conduct, and the Society's prizes to workmen for long and meritorious service. Time would be gained if the latter prizes could be awarded apart from the general proceedings of the annual congress, so as to allow more scope for technical discussions.

The meetings of the Society held in the capital are generally well attended; and the one just closed was no exception to the rule. The congress of 1908 will be conspicuous for the attention given to the subject of vertical retorts and high-pressure distribution, and to the announcement of the conclusions arrived at by the Commission on the International Unification of Screw-Threads, the presidency at the conferences of which necessitated the occasional vacation of the chair by M. Coze, whose place was, however, ably taken by his successor, M. Godinet, of Lyons. There were two interesting visits; the subscription banquet was well attended, and afforded an opportunity for social intercourse; and a *soirée artistique* brought to a close a series of meetings in what was truly a City of Light, for Paris was basking in brilliant sunshine the whole time. The congress will also be memorable for the acceptance, by a goodly number of the members, of the cordial invitation sent to them by their British colleagues, to which reference was made in the course of the proceedings. These international visits are evidences of the *entente amicale* among members of the gas profession to which M. Coze referred at the close of his address; and it is to be hoped they may become more frequent.

A Gas Company's Bargain with the Coalite Company

A VOLUNTARY apology may be made to the British Coalite Company. The suspicion a short time since was aroused in our minds that an earnest hope on their part that they had at length succeeded in getting a Gas Company to lend them a helping hand over the awkward stile that they found before them had been magnified into a belief that the contract was as good as signed, sealed, and delivered. The secret is now out; and the suspicion is shown to have been ill-founded. The Coalite Company were not, in one sense, indulging in any flights of imagination. They have actually persuaded a Gas Company to come to their assistance; and Sir Joseph Bellamy, as Chairman, at a meeting of the shareholders, confesses it to be the Plymouth Gas Company, whose administration has long held honourable and notable place in the gas industry. Knowing Sir Joseph, knowing the business acumen of his colleagues, and the skill of their Engineer and Manager (Mr. P. S. Hoyte), there would have been surprise if any agreement had been entered into in connection with the Coalite Company that did not in most, if not in all, respects safeguard the Company. Reading one part of the remarks of Sir Joseph on this Coalite agreement, it appears that he and his colleagues

> **In the morning eyed the pleasant fields**
> **Visioned before.**

But in the evening, before the contract was signed with the Coalite Company, all the risks were on the latter; and the Gas Company stood to lose nothing at all, if their roseate estimates of the effect of the operations of the Coalite Company upon their coke and tar markets are really justified in the event.

Sir Joseph, with his usual urbanity, paid the "JOURNAL" a little compliment in his speech, and rather anticipated that the action of the Company in this matter would be subjected to some severe criticism. We trust that he will not be disappointed. On this occasion, there is no intention to criticize. The experiment is a limited one. The Gas Company are running comparatively little risk; and we shall not—now that they have been induced to extend their patronage to the Coalite Company on the principle of "heads I win, tails you lose"—be among the least observant of interested spectators of the trial. The exact terms upon which the contract has been arranged are confidential; but Sir Joseph, as in duty bound to the Company's shareholders, told them sufficient to assure them that the Directors were not in any way gambling with their interests,

and that, for good or for ill, present responsibility rests absolutely on the Coalite Company. This Company can hardly be satisfied with the terms. Beggars, however, cannot be choosers; and into a gas-works they had to get at any price at some time or other, to prove the fallacy of adverse criticism, or to finally shatter the castles they have built in the air and illustrated in prospectuses. However, we do not suppose the Company will be prepared to enter into further engagements on similar conditions for the present, unless (if rumour at one time spoke truly) their financial position has lately considerably improved, and the speculative fever from which they have been suffering has not yet abated. Anyway, until there is some authentic statement as to the results of the experiment from Plymouth, other gas companies will do well to watch and wait. The question of permanence is the critical one, even under the terms upon which the Plymouth Gas Company are proceeding; and until permanence of operation is assured, they must maintain sufficient gas-making plant in reserve to meet any emergency arising from the fortunes of the Coalite Company.

Be it particularly marked, that the Plymouth Gas Company have not adopted the Coalite system as part and parcel of their own manufacturing plant. A site has been cleared on their works for the accommodation of the plant, so that it will be under the direct observation of the Company's Engineer; and they are merely purchasing from the Coalite Company the gas made at a price below their own present cost of manufacture—"cost" after, we assume, deducting the profit that they lose on the sale of the residual products from the carbonization of some 15,000 tons of coal per annum, which would, under the ordinary system of carbonization, more than produce the gas that will be derived by the Coalite Company from the 30,000 tons of coal with which they propose to deal at Plymouth right away from the outset. It is understood that three sets of carbonizing chambers are to be installed—two sets to be worked, and one set reserved as a stand-by. The information Sir Joseph Bellamy imparted to the shareholders was that the plant to be put into operation at the outset would produce 500,000 cubic feet of gas per day—that is, 250,000 cubic feet per set—and that 20,000 tons of coke (pardon! we should have written "coalite") per annum will be produced. From these figures it is calculated that they will have to carbonize about 30,000 tons or so of coal per annum, from which 150 to 160 million cubic feet of gas, or thereabouts, will be made. The output of the Plymouth Company is in the region of 1,100,000,000 cubic feet per annum; so that, all things considered, they are not taking upon themselves any serious risk. *If* financial success is achieved, *if* the public of Plymouth take kindly to coalite, *if* the Plymouth Company suffer no monetary loss from residuals, *if*—— Well, there seem to be many "ifs" about it all; and what we want to get at is, if good really results, the Coalite Company will be under a deep debt of gratitude (to use a trite observation at meetings of technical societies) to the Plymouth Gas Company for the compassionate move that they have now made. If not, then coalite will make its bow and final exit so far as the gas industry is concerned. The aspect of the present announcement that is the most admirable is the exemplary caution exercised by the Plymouth Board of Directors.

Coal Mines (Eight Hours) Bill.

The Coal Mines (Eight Hours) Bill was discussed in the House last Tuesday, on a motion by the Home Secretary for its second reading. Mr. Gladstone was not at his ease in making his speech in support; and his manner towards those in opposition was at times not altogether courteous, and showed signs of irritability. The feeling was manifestly upon him that he had the mass of public opinion against him in connection with this measure. He had invited public opinion—that is to say, the opinion of the consumers of coal; and the weight of it has been disconcerting, though his prepossession and pledges have prevented him shifting his position in any degree worth accepting. Although his speech was of some length, he made out no case for the statutory restriction of hours in coal mines, nor for parliamentary interference with adult labour in any way. If he did anything at all, it was to show how devoid of substance are the reasons for inflicting injury on the whole of the industries of the country and on the millions of people who are not coal miners. His appeal was more to the emotions than to common sense; and the grounds of his appeal—the health of the miners and the character of their employment—do not stand the critical inspection of experience. His insensibility to the ulterior effects of the restriction of hours in coal mines seems more fictitious than real; and as one rises from a study of his speech, the feeling is strong that throughout the politician is in greater evidence than the national economist and protector.

There can be no question that, if the Bill passes into law, it will be by the force of numbers on the Government side of the House rather than by the force of public opinion outside. It turns out, indeed, that the interviews by coal consumers with Mr. Gladstone have been somewhat farcical. He invited them to state their objections to the Bill; he seems angry now that they responded so freely. He looks upon the agitation against the measure as the work of factions; the arguments put before him as pure fiction. This is unfair of the Home Secretary. There is, to say the least, a lamentable absence of balance about his speech. Take one point. His estimate of the views of the delegates of the vast industries who, consonant in their opinions, moved before him one after the other, does not agree with his admission that he had before him at these interviews men of experience and knowledge of trade and industries. This admission is against Mr. Gladstone. It is quite feasible that his views as to the possible effects if the Bill passes do not agree with those of these men of "experience and knowledge "of trade and industries;" but we would rather rely upon the views of such men than upon those of men who can only form judgment from afar, even though they occupy the lofty heights of a Cabinet Minister. The fact of the matter is that the Home Secretary has, in the interests of party, kept open ears for all that the Miners' Federation wished to pour into them; and they have poured in so much that it has deafened him to the warnings of experience and of the knowledge of trade and industries.

It is admitted, by the Home Secretary, that reduction of hours may have for consumers a temporary adverse effect, but that any increase in the price of coal will soon find its level. This can only be regarded either as a piece of optimistic pretence, or an indifference to circumstances and to the history of events in our home coal market. There is not much use going abroad to see what has occurred there through regulation of hours. The conditions are altogether different. Our home coal market is peculiarly sensitive; and rumours and fears are as responsible for as many upward turns of the home market as are the pure actualities that otherwise rule the fluctuations of prices. The wages of the miners, too, are regulated by coal prices; and of this there may be certainty, that the Miners' Federation, in urging the Government forward in this manner to secure a statutory restriction of working hours, have no intention that the individual who has placed himself under their protecting wing shall suffer pecuniary harm. The view of the future to the instigators of the measure is more open than it is to their Ministerial agents, who, even on their own assumption of only temporary injury to the consumers, fail to appreciate the expanse of that injury in all directions, and the money penalizing of all classes that will be entailed. Sir George Livesey was quoted in this connection during the discussion in the House; and allusion to the harm that would be inflicted on the millions of small gas consumers if the price of coal was permanently raised by the factitious means that would be created by the Bill, was received from the Government benches with "ironical laughter," which is a fair measure of the value attached to experience and knowledge by the political backers of the Bill.

However, the second reading has not yet taken place. The Government have awakened to the fact that, in this matter, they are not, on their own side of the House, without an amount of defection; and they therefore consented last week to an adjournment of the debate. But a more important indication of a feeling of unrest over the matter is the postponement, from eighteen months to five years, of a definite eight-hour day from bank to bank, by excluding during the quinquennium the windings, so that the average working day in that period will be eight and a half hours. Another point upon which the Home Secretary laid stress in essaying to build up a case destructive to opposition, is that provision is made in the Bill for sixty hours' overtime during a year—a little more than one hour a week! Comment on this would be superfluous. But these various mitigating points are merely the trimmings to the main purpose of the Bill, which is an ultimate eight-hours day, with scorn to the consequences. The brunt of all this may fall, if the Bill succeeds, when some other party is in power.

Low Illuminating Power Gas from Coal.

At the recent meeting of the Institution, Sir George Livesey remarked upon the existence of the necessity for a greater intermingling of science with the work of the practical gas man in order to attain to greater ends. This is essential; and there has been consistent advocacy in the "JOURNAL" in this respect for many years past. But we cannot admit that the practical gas maker has come to the end of his tether in the matter which Sir George made the starting-point of his comment. He said that difficulty was found in making from coal the gas that Parliament now authorized gas suppliers to distribute, without admixture with a totally different gas. In an article on "The Returns of Gas Testing in London" published in our issue for March 26, 1907, it was stated that the result of the change in testing-burners appeared to be that "the South Metropolitan Company are now credited with supplying gas averaging well over 16-candle power; and are apparently—taking the evidence of these figures alone—now deriving little or no benefit from the dearly bought reduction of their statutory illuminating power to 14 candles in 1900. The Company manufacture coal gas only; and it seems that they have been unable advantageously to produce coal gas approaching 14-candle power under the new conditions of testing." Since these words were penned, there has been much carbonizing done in vertical retorts, in inclined retorts at an angle of 45°, and in other directions—for the most part the work of the practical gas maker. The illuminating power (tested by the "Metropolitan" No. 2 burner) and production figures published at the Institution meeting the week before last in the papers by Mr. Hayman, Mr. Woodall, and in the report by Dr. Colman and Mr. Broadberry are all relevant to Sir George's observations, and to what we pointed out so long since was an obvious conclusion from the official gas testings in London. They show that the practical gas man has not come to the end of his work in this connection; but the more his work can be blended with that of the scientist, the sooner will truth and greater successes be the common possessions of the industry.

The Money Requirements of No. 99, Cannon Street.

There is an insatiableness about the money requirements of the energetic gas and water promoters of No. 99, Cannon Street; but we do wish they were not interested in the births of so many concerns, as numbers and titles are becoming confusing. For instance, we are now in a little doubt whether the Water and Gas Debenture and Share Investment Trust, Limited, which was appealing to the public for £20,000 in March last and the Water-Works, Lighting, Power, and Investment Corporation, Limited, who are now inviting applications for £5000 6 per cent. first mortgage debenture stock, are one and the same "enterprise." The temptation offered to imbecile investors in respect of this debenture stock is a full six months' (five months accrued) interest payable to "successful" applicants to-morrow. The subtleness of these promoters makes an interesting study. The debentures are to be a first charge on assets "valued" at £45,718 3s. 2d. "Valued" by whom? Meantime, other promoters whose names are all too well-known now to the gas industry, Gyde and Darby (with the man Bernard) have been committed for trial, in connection with certain of their exploits in the slate industry.

More Satisfactory Results.

It is a pleasure this week to record some more satisfactory results of the working of municipal gas undertakings during the past year; and in saying this, there is no intention to hint that in some instances the reports have not been of a gratifying nature. So far from this being the case, there has been a practically uniform tale of progress and strong financial position to relate; and if reference is made to one instance more than to another, it is merely with the object of drawing attention to some outstanding features, and not with any idea of placing one works before another. At Longton, the Engineer and Manager, Mr. W. Langford, has been the recipient of a well-deserved vote of thanks and many appreciative remarks from his Committee with regard to his excellent management of the Gas and Electricity Department of the Corporation. The past year is stated to have been the most successful on record for the undertaking. The make of gas per ton of coal was 12,328 cubic feet, and the quantity sold 11,630 cubic feet; while the amount of coke sold per ton of coal carbonized was 11·5 cwt. When the Committee's minutes were before the Council, one member pointed out what is clear from these figures, that the working results were exceptionally good. Continuing, he remarked that "last year out of the published returns of 121 gas undertakings in various parts of England, Longton came out an easy second; having produced an average of 12,260 cubic feet of gas per ton of coal used." The gas sold for the past year shows an increase of 4·1 per cent. over the preceding twelve months; while the percentage unaccounted for—4·54—is the lowest recorded in the history of the undertaking. There has, as a matter of fact, been an increase in the quantity of gas sold of more than 4 per cent. for each of the last three years. Under these circumstances, an early reduction in price is foreshadowed. It is to be noted that at Oldbury also the unaccounted-for gas has been reduced by Mr. A. Cooke, the General Manager, from 5·9 per cent. to 4·36 per cent. The quantity of gas supplied to consumers by meter was 110,428,000 cubic feet, against 101,726,000 feet the previous year. The report of Mr. Arthur Andrew, the General Manager of the Oldham Corporation Gas Department, shows that the increase in the cost of coal and other gas producing and enriching materials during the past year (apart from the enhanced price obtained from coke) increased the cost of production to the extent of 2d. per 1000 cubic feet of gas sold; but fortunately the sale of coke has been instrumental in bringing down this increased cost from 2d. to ¾d. per 1000 cubic feet sold. The extension of machinery for stoking and the removal of coke from the retort-house has resulted in a further substantial saving in carbonizing wages. The quantity of gas manufactured exhibits an increase of 4·06 per cent. compared with the previous year; while the loss from leakage was 5·12 per cent., against 5·69 per cent.

Monopolies and Municipal Trading at the Pan-Anglican Congress.

Anyone reading through the reports of last week's meeting in London of the Pan-Anglican Congress could not fail to be struck by the number and diversity of the questions dealt with in the different sections. Naturally, most of the matters do not call for notice here; but brief reference may be made to Section A, which was devoted to the "Church and Human Society," and which had before it the subject of "Monopolies," in which was included "Municipal Trading." First, the Standard Oil Company were subjected to a severe handling by Mr. Justice Hannington, of New Brunswick; and then Mr. George Lansbury advocated the municipal control of all monopolies which affect the well-being of the masses of the people in well-defined areas. He will have difficulty in persuading a great many people to agree with him in his opinion that it is not Socialism or municipal trading that is on trial, but private enterprise. Subsequently Mr. E. H. Green, a member of the City Corporation, who, to use his own words, attempted to put the matter forward from the cold-blooded point of view of the business man, adduced some of the more potent arguments against the extension of municipal trading. He pointed out a fact which has already been often emphasized—that municipal employees now constitute a very large proportion of the voting strength of the country—one-seventh of the whole number was the proportion which Mr. Green put down as being municipal officials. What was more human, he asked, than that the municipal councillors should propitiate such a large body of electors by unwise concessions from time to time? What, indeed! Nor can the truth be denied of the assertion that, by reason of their voting power, at election times the municipal servants become the masters of the councillors; and that this is a dual character which constitutes a danger to the community. Further, Mr. Green contended that the gas which was supplied by municipal corporations was in ninety-nine cases out of a hundred more costly than that of private enterprise; and when this statement was challenged, he retorted that it could not be gainsaid because the figures proved it. Apparently he did not, however, quote the figures on which he had based this somewhat sweeping assertion. Then, again, he said that gas-owning municipal corporations had for years opposed the introduction of electric light and energy, and had so prevented the progress of industry; and as, according to "The Times" report, there was no dissentient voice raised, it may perhaps be assumed that his hearers agreed, though it might have been said that there are certainly exceptions to be found to this charge.

OUR VISITORS FROM FRANCE—WELCOME!

On Sunday evening, the members of the Société de l'Industrie du Gaz en France who had resolved upon an excursion to this country after their meeting in Paris, the proceedings at which are recorded in another part of this issue of the "Journal," reached London, and were soon personally welcomed by friends associated with the British gas industry. The party number nearly 100, including about twenty ladies. M. and Mme. Coze and M. Godinet are among the distinguished members of the party. M. Coze is the outgoing President of the Société, after two years' service in the chair, during which period his *bonhomie* in the conduct of proceedings, and his assiduity in forwarding the interests of the professional gas organization of France, has endeared him more than ever to his professional colleagues. His name will long be cherished in the gas industry, and honoured as the man who made carbonizing possible in retorts inclined from the horizontal, and did much in assisting to render the system perfect. M. Godinet, who succeeds him in the chair, is also distinguished in the gas profession of France for the high official position that he holds as Engineer to the Lachomette group of gas companies, whose operations are centred in several places in France and elsewhere.

It was yesterday morning that the representatives of the British gas profession came into closer touch with their *confrères* of France; and this was made possible by the joint and generous hospitality of Mr. Corbet Woodall and Mr. H. E. Jones, both of whom are honorary members of the Société. They invited the whole of the visitors to luncheon in the Garden Club at the Franco-British Exhibition; and with the Misses Woodall and Jones they welcomed their guests in the vestibule of the dining hall. Many were the well-known faces met directly on entering. Immediately encountered, besides the President and the President-Elect of the Société, were M. Visinet, M. de Brouwer, Mr. Salomons, and many others too numerous to mention. Thoughts flew back to the great Gas Congress in Paris now eight years since, and to occasional meetings later; and it was a pleasure to see that time has dealt so gently with many a one bearing an honoured name in the gas professions of France and Belgium. But there were also present among the Britishers meeting the visitors, in addition to the hosts, the President of the Institution of Gas Engineers (Mr. T. Glover), the Senior Vice-President (Mr. James W. Helps), and the Hon. Secretary (Mr. S. Y. Shoubridge). Mr. R. S. Gardiner, Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, and Deputy to Mr. H. E. Jones in the Chairmanship of the Gas Section of the Exhibition, Mr. Thomas Goulden, Chief Engineer of the Gaslight and Coke Company, Mr. Stanley Jones, Engineer of the Commercial Gas Company, Mr. A. E. Broadberry, Engineer of the Tottenham Company, Mr. F. W. Goodenough, and several others were present, including gentlemen whose names are closely identified with Continental gas enterprises having central offices in London.

We have here a list of the acceptances for the luncheon taken from the prepared plan of the tables; but as the arrangement was not precisely adhered to, it is impossible to say, with such a number of guests, whether or not the whole who accepted were actually present. There was one whose absence was greatly deplored, and that was M. Payet, the Secretary of the Société; and M. Coze desires us to say how much all regretted that he was unavoidably prevented from attending, owing to ill-health in consequence of his exertions at the meeting in Paris.

The names appearing on the plan for the top table were:

Mr. H. E. Jones (Chairman), Mr. Corbet Woodall, M. Coze, Mme. Coze, Mme. Martin, M. Godinet, M. Gaston Gautier, Miss Jones, Mr. Gardiner, Mme. Cros, Mrs. Williams, M. Marquisan, Miss Woodall, Mr. Hesketh Jones, Mme. Gautier, M. Visinet, M. Bacheley, Mr. F. Jones, Miss Woodall, M. Seguin, Mrs. F. Jones, M. Chamon, Mme. Dutey, Mr. Henry Woodall, Mme. Coudelou, M. Alayrac, Mr. W. Martin.

The Vice-Chairmen at the cross-tables were:

Mr. T. Glover, Mr. J. W. Helps, Mr. Harold Woodall, Mr. Stanley Jones, Mr. A. A. Johnston, Mr. D. Milne Watson.

Among other guests were:

M. Schnurr, M. Stucker, Mr. F. D. Marshall, Mme. Petit, Mr. F. W. Goodenough, M. de Savignac, Mr. D. H. Helps, M. Petit, M. de Prez-Crassier, M. Rousselle, Mme. Peschot, M. Rouveure, M. Salomons, Mme. Martin, M. Martin, fils, M. Tricot, M. Marin, Mme. de Prez-Crassier, M. Moussoir, M. Peschot, M. M. Martin, Mr. S. Y. Shoubridge, M. Lhomme, M. Marcou, M. Mariez, Mme. Stucker, M. A. Martin, M. Metzger, M. Moirand, Mme. Lhomme, M. Labesse, M. Lacaze, Mlle. Rousselle, M. Laforgue, M. Larbitray, M. Laval, Mr. Carpenter, M. Jiguet, M. Kuentz, M. J. Goudard, Mlle. Rouveure, M. Maignan, M. Kern, M. Kirkpatrick, Mme. Laval, M. Gautier, M. Gerard, Mlle. Malattre, M. E. Goudard, M. Guillet, M. Huon, Mr. T. Goulden, M. Dutey, M. Dupoy, M. Echinard, Mlle. G. Martin, M. Fiard, M. Foillard, M. Freyss, Mme. Kern, M. M. Chevalet, M. Cros, M. Derval, Mme. Moussoir, M. Dulac, M. Duris, M. H. Chapat, Mr. W. Williams, M. Marcel Calvet, M. C. Chapat, M. Chervet, Mlle. Y. Martin, M. F. Chevalet, M. Conrad M. Coudelou, Mme. Kuentz, M. Bode, M. Brandt, M. Brissot, Mlle. Kuentz, M. Calvet père, M. Cameleyre, M. Canler, Mr. A. E. Broadberry, M. Heeley, Mr. Webber, Mlle. Bardy, M. Bertrand, M. Bertin, M. Bardy, Mme. Huon.

Luncheon concluded,

The Chairman (speaking in French) said that his colleague (Mr. Woodall), who had reserved himself for the banquet which would take place under his presidency on Tuesday night, had very kindly insisted upon him (Mr. Jones) presiding at this luncheon, to which they had invited their friends from France. This would explain why Mr. Woodall, who is at the head of the Gaslight and Coke Company—the most important Gas Company in the world—was not occupying that day the seat which rightfully belonged to him. It was to him (Mr. Jones) a great honour and also a real pleasure, as Chairman of the Gas Section, to give their guests hearty welcome to the Franco-British Exhibition. This exhibition had already been honoured by a visit from M. Fallières, accompanied by the King. He (the Chairman) cordially invited them to drink to the health of His Majesty the King of England, and of the President of the French Republic. He was sure, he said, he would only be expressing the feelings of all present in asking them to associate themselves with this toast to the heads of their two countries—the King of England, so well known in France, and M. Fallières, equally known and appreciated in England.

The toast having been drunk,

The Chairman again rose. He asked to be permitted to say a few, and only a few, words on the subject of the exhibition, at which their visitors had taken a glance. He would, however, limit himself to the portion which specially interested them—namely, the Gas Section. They would no doubt remember that about three years ago they had in London an exhibition devoted entirely to lighting by gas; and so they would not expect to find at the present exhibition so complete an exposition of all that related to the manufacture and use of gas. But he must acknowledge that the Gas Section did not quite come up to all the Committee wished. They were desirous that the manufacturers of appliances of all kinds should show their latest novelties in construction and in machinery for the manufacture of gas. Unfortunately, they did not respond to the Committee's appeal. However, they had been able to see, or they would do so, some improvements in the gas industry which would certainly possess great interest for all. He might direct attention particularly to the high-pressure gas-lamps, which, it appeared, gave the light of 60 to 70 candles per cubic foot of gas consumed. It would, he thought, be noticed that the lighting of the Avenue of the Colonies with Keith lamps was superb, and demonstrated incontestably that gas still remained the finest and the most economical light for streets, as well as for houses. He took the opportunity of expressing to Mr. Milne Watson, the Vice-Chairman, and to Mr. James W. Helps, the Honorary Secretary, of the Gas Section Committee, his (the Chairman's) sincere thanks for the devotion they had displayed in bringing to a satisfactory conclusion so difficult a task; and he might add especially to Mr. Woodall, for his influence and friendly support. He must say that to these three gentlemen belonged, in the greatest degree, the honour attaching to this undertaking. Before sitting down, he proposed prosperity to the Société Technique de l'Industrie du Gaz, which had contributed so much, and would, he was persuaded, contribute still more, to the progress of our important industry—an industry which had never occupied a higher position than it did now. Mr. Woodall and his colleagues who were honorary members of the Société united with him in proposing this toast. He drank to the health of the President, the Committee, and the members of the Société Technique, and of the ladies who had honoured them with their presence.

M. Coze, in responding, said he very cordially thanked Mr. Corbet Woodall and Mr. H. E. Jones for the kind reception they had given them that day. These gentlemen had been their friends for a very long time; and they were very pleased that the Société Technique were able to count them as honorary members. It was known that to these two gentlemen they largely owed the Gas Section of the Exhibition; and the members of the Society regarded it as a very special honour that the names of these two honorary members should have been so prominently identified with the organization of the section. He would also like to express their recognition of the work of Mr. James W. Helps and Mr. D. Milne Watson on the Committee. At various times during the last twenty years the members of the French Society had always been wonderfully well received by their British colleagues of the Institution of Gas Engineers; and the receptions had grown better and better each time. In return, the French Society had not really done anything at all; and therefore they were much in debt to their British friends. The French Society had hoped to repay in a certain measure all that they owed by organizing an international gas exhibition; but circumstances beyond their control had prevented them doing so until now. But he (M. Coze) hoped his exertions would bring this exhibition to a happy consummation. In England, great exhibitions had been very scarce; and he thought he might say that since 1855 there had not been any international exhibition; and now they were indeed flattered to see that the first International Exhibition was a Franco-British one. He took advantage of this exhibition to say that the feelings between the two nations were undoubtedly most cordial; and they hoped these feelings would increase. In the gas industry it was unnecessary there should be any *entente cordiale*, because the gas professions of the two countries understood each other perfectly well, and their relations had always been of the best. In thanking their hosts and British friends, he should like to say that the Société Technique were happy in having on their Committee Mr. R. S. Gardiner, who had shown himself at all times charming and delicate. He (M. Coze) felt certain that if they could add to the solid British qualities the qualities of the French nation, they would achieve much. In the gas profession they must try to unite these two characters in the interests of the prosperity of the industries. They had had the pleasure of receiving in France Mr. Glover, the President of the Institution of Gas Engineers; and they had a good remembrance of the interesting communication he gave them in France in connection with the Sub-Committee on the International Standardization of Screws. He (M. Coze) raised his glass in honour of Mr. Corbet Woodall and Mr. H. E. Jones. (The speech,

which was also delivered in French, was animated, and much applauded.)

The CHAIRMAN: I thank you from the bottom of my heart.

Mr. WOODALL said he also thanked all present for the way in which they had received the observations made by M. Coze. He felt deep regret that he was unable to respond in the beautiful language of France; but all he could do was to simply accept the position. He was reminded of an old story of the late Lord Beaconsfield, when he was going out to attend a great conference of the Powers in Berlin. He announced to his Secretary (who loved him very much) that he intended to speak and make his address to the Conference in French. Lord Beaconsfield was a great man; and his command of French was not his strongest point. His Secretary was particularly anxious that he should not speak in French, so he suggested to him that everybody knew he was a great master of the English language and a great orator; and therefore he was sure the conference would be greatly disappointed if he did not address them in his own tongue. (Laughter.) Now he (Mr. Woodall) was sure that Mr. Jones's address had been perfect in every respect—that he could not have said in his own tongue probably more than he had said in that of their visitors. But he was quite sure that if Mr. Jones had spoken in his own tongue they would have enjoyed it better, and he (Mr. Woodall) would have known what he was saying when he used his name. (Laughter.) For his own part, he simply said they welcomed their friends very cordially indeed as *collaborateurs* with them in their great industry; they welcomed them as members of a Society which was doing great work in helping to forward and advance that industry; and they welcomed them even more as citizens of a country and members of a nation with whom all Britishers were most anxious to live on terms of growing intimacy, friendship, and alliance.

M. VISINET remarked that, on behalf of the members of the Société Technique, he wished to thank their friends for having extended their invitation to the French ladies; and he also thanked the English ladies who had kindly come to give them welcome. He gave them the health of the English ladies.

Mr. R. S. GARDINER, at the request of the Chairman, responded in French on behalf of the ladies. He said he did so with great pleasure, because the English ladies would wish him to say that they had had the greatest pleasure in coming there that day—and not only because of the family ties that they represented. Incidentally he might mention to his colleagues of the Société Technique that most of the ladies belonged to the families of their hosts, who had thus given additional evidence of their keen sympathy with the Society. But these ladies were also representing the sympathy of all English women towards the French ladies in their national character. He was sure he was voicing the feelings that were uppermost in the minds of all the English ladies present in saying that it gave them the greatest possible pleasure to be present to testify to the friendly sentiments which happily prevailed between the two nations, and that they had been only too glad to welcome here so many French ladies. He was sure they desired him to express the hope that the friendship between the two countries was not confined to the male element only, but existed in what was still called the "weaker sex," whose influence could not nevertheless be disregarded. On behalf of the English ladies, he thanked M. Visinet and the members of the Société Technique and their ladies for the compliment paid them.

Subsequently, the company were photographed on the lawn in front of the Garden Club. Afterwards there was an inspection of the Gas Section; and far into the evening many were still seen wandering through the buildings and grounds, familiarizing themselves with the wonders of the great show.

Local Government Board Mistrust of Municipal Audits.

The Monmouth system of managing the finances of the municipal electricity department is not to be commended to other authorities. That system was exposed before the Unopposed Committee of the House of Commons last week on a Bill to confirm a Provisional order relating to the Monmouth electricity undertaking being introduced. The Monmouth Council it will be remembered were taken to task for their loose keeping of the finances of the department at the time of a Local Government Board inquiry into an application for a loan, when the Board refused to sanction any further loans until there is a change. Mr. Boyce, on behalf of the Local Government Board, told the Unopposed Bills Committee that there had been a sum of £45,000 paid to contractors; and there were no books recording the outlay. The Corporation, in fact, had not a single shred of evidence in their possession beyond a bundle of engineers' certificates. These were nothing more than orders to pay, and seemed to have been written on ordinary note-paper. The audit was of a superficial character; and the Board had insisted on some change of audit. This conversation followed: The Chairman (Mr. Emmott): I am afraid what Mr. Boyce has told us shows an extreme want of care on the part of the Corporation. I suppose it is due to lack of business capacity? Mr. Boyce: I do not suggest *mala fides*. I bring no charge of fraud of any kind. The Chairman: It is an extraordinary case, and I hope such instances are rare. Mr. Boyce: I hope so, too, sir; but I may say that I have a great distrust of municipal audit—not only in small towns, but in large. The Chairman: The audit ought to be thoroughly independent? Mr. Boyce: Yes, as in the Plymouth case.

We regret to announce the death last Friday of Mr. A. H. Godwin, who for nearly 41 years was Manager of the Watford Gas-Works. It was only last Tuesday that we recorded Mr. Godwin's resignation of the position on account of ill-health.

TERRITORIALS AT CHISLEHURST.

A Peaceful "Invasion."

LEARNING that an "invasion" in force by certain companies of the territorial army was anticipated at Chislehurst last Thursday—the objective being the beautiful grounds attached to "Walden," the residence of Mr. Corbet Woodall—a representative of the "JOURNAL" journeyed to the spot to witness their arrival. That ample preparations had been made to receive them was ascertainable by the simple method of inspecting a huge marquee which had been erected for the occasion; but had any possible doubt on this point been harboured, it would have promptly been removed when they did arrive.

In case of any misapprehension, it may be as well to state here that at Beckton the Gaslight and Coke Company have two companies belonging to the territorial army—one in connection with the products works, and the other recruited from the gas-works. Under the volunteer scheme, these companies belonged to the "Central London Rangers," Twenty-Second Middlesex Regiment, and, as will be gathered from the speeches recorded below, when the territorial forces were formed, the companies became part of the "Rangers," Twelfth Battalion, County of London Regiment—a battalion that earned fame by the extraordinary promptness with which it was organized under the new conditions. The strength of the two companies is now a little under 200—"B" company (from the products works) being somewhat stronger than "G" company (from the gas-works). Mr. Corbet Woodall, in his position as Governor of the Gaslight and Coke Company, was naturally gratified by the readiness the men who were volunteers had shown to place themselves under the new scheme; and he conceived the happy idea of inviting them to march down to Chislehurst, with results that were manifestly as pleasing to him as to his guests—which is saying a good deal. It may here be remarked that Mr. Corbet Woodall is strongly of opinion that to a large extent the success of the territorial scheme depends upon the behaviour of employers towards their men with regard to the time spent in camp; and the Company have accordingly made arrangements in the matter of pay which will prevent the men being serious losers owing to the calls which the scheme may make upon their time. The resolution of the Board dealing with the matter is in the following terms: "The Directors have decided that, when an officer or employee of the Company goes into camp for his annual training, he shall be allowed special leave of absence with pay, in addition to his annual holiday, to the extent of one half the actual time he remains in camp for his annual training. Special leave of absence shall in no case exceed seven days. He shall further be allowed leave with pay for one half-day in the year for the regulation course of musketry, if required to be absent from the Company's service for that purpose."

The march from Beckton was about 8½ miles, and it was accomplished in very good time. It says much for the stamina of the men, that not a single one fell out, in spite of the fact that the day, though ideal for lunching under a tent, was somewhat hot for marching in a dark uniform. The first sign of the approach of the companies was the sound of martial music, which was heard from the house shortly after two o'clock, and the second was a cyclist scout riding up the drive. Very soon after this the men trooped into the grounds, under the command of Mr. T. Wilton, Captain of "B" Company; Lieutenant Carpenter being in charge of "G" company (of which Mr. G. Wilton is Captain). Other officers with "B" company were Lieutenant Foucar and Lieutenant Monier-Williams. They were accompanied by the battalion band (which includes the members of the Beckton band, the majority being ex-army bandsmen), under Band-Master A. E. Bensen-Ansley. The band's accessories, it would be remiss not to mention, were conveyed in a cart from the products works, drawn by a magnificent horse from the department, who was (and quite worthily) the bearer of several brass tablets recording conspicuous recognition at Cart Horse Parades.

The order to "Dismiss" having been given, the men, after a welcome wash, repaired to the marquee, where a substantial meal, to which they did ample justice, was awaiting them—the chair being taken by Mr. Corbet Woodall, who was supported by Mr. Milne Watson, the General Manager of the Company, Colonel Coldicott, V.D., the Commander of the Battalion, and the officers already mentioned. A stranger glancing at the rows of men as they sat at table would have made a pardonable mistake if he had taken them for soldiers lately returned from active service abroad—so bronzed and "fit" did they look—instead of those whose avocation is a peaceful and not a warlike one.

After the lunch, Mr. Corbet Woodall proposed the toast of "The King;" and this having been duly honoured, he remarked that, though he did not intend to waste time on speech-making, there was one toast more which he was sure those present would drink with pleasure—namely, "The Navy and Army, and especially the 'Rangers.'" Those before him were now making a new departure; and he could not tell them how proud he was, as an officer of the great Gas Company with whom they were all engaged, to hear how very cordially they had responded to the invitation to change from the volunteer into the territorial army. This change appeared to him to be a very wise attempt to make of the Volunteer movement a still more efficient method of

strengthening the defensive forces of the country; and that the men who were there that day should immediately have done as they did, without waiting to see what others were going to do, was to him a great source of satisfaction. It would be difficult to over-estimate the importance of the Volunteer movement. In a sense, they might say of it—as Shakespeare described mercy—that "it is twice bless'd." It was a blessing to the men, who secured by means of it an admirable method of improving their physique and enjoying one of the very best forms of sport and recreation; and at the same time they were adding to the security in which those dear to them, and the country generally, were able to live. It was unnecessary for him to point out what efficient service was rendered by those who enlisted and went abroad during the recent deplorable war. But whether or not they were ever called upon to fight, the possession of the knowledge that they were able to do so was a great help to them in holding their own in the world. Of course, it was necessary that they should know how to shoot. He had been reading of a man somewhere out in the western part of America who was asked whether there was any good shooting in the neighbourhood. The man replied: "I guess, yes. I have seen six men shot in the saloon in the town in one afternoon." Well, this was not exactly the kind of shooting the questioner was asking about, nor was it the sort of shooting they wished to see here; but at the same time, if they were to have an orderly community that would prevent them from being shot in their saloons, a disciplined people was a good way of securing it. If they had confidence in themselves, they were not likely to be disorderly and brutal. He concluded by proposing the toast, with which he wished to couple the name of their good friend and commander, Colonel Coldicott.

In responding, Colonel Coldicott remarked that it was his great privilege, by the kindness of Mr. Corbet Woodall, to be in the proud position of being able to respond on behalf of the "Rangers," Twelfth Battalion, County of London Regiment, to the toast that had just been so feelingly proposed by their host. It was also, he might incidentally remark, owing to the same kindness on the part of Mr. Corbet Woodall that the Rangers were there that day, enjoying such a delightful outing and such a complete change from their usual environment at Beckton. Those present knew very well his opinion on the subject of the toast—that was to say, the importance, in his view, of every man in this country who was physically fit to do so, donning a uniform and taking his part in the scheme of defence. Not only should they learn how to shoot, but how to manœuvre and how to drill. Mr. Corbet Woodall had, as a fact, stated no more than the actual truth when he told them how well "B" and "G" companies had responded to the call which had been made upon them to enlist in the new territorial force. It was with great pride that he, as commanding officer, recalled the excellent manner in which the men answered. He believed he was correct in saying that the "Rangers" was the first battalion of volunteers in the United Kingdom to qualify in point of numbers as a unit in the new territorial army, and to go over as a unit of that army. It would be within the recollection of all that he called a parade for the very first day that the Act came into operation—on April 1 last—and before that day was very old, they had enlisted more than sufficient members to enable them to be recognized by the Army Council as a battalion in the territorial army. He wished to make what might perhaps be regarded as a little bit of a confession, and to say unreservedly that, had it not been for the splendid manner in which the Beckton members of his battalion came forward on that occasion, he did not think they would have been in a position to be recognized on that first day as a unit of the territorial army, and he was not even sure that they would have been there now as members of a unit. He took this opportunity of thanking "B" and "G" companies most heartily for having responded so nobly to his appeal to them to join the new territorial army; but his thanks were due, not only to them individually, but to the great undertaking in which they were all engaged—the Gaslight and Coke Company. The Company had shown a splendid example to all employers of labour throughout the country; and if others would follow this example whole-heartedly, there would be no question of the territorial army being a success. It would be a success; and they would have had the number required by the Secretary of State for War, if everybody had exhibited the public spirit that the Gaslight and Coke Company had done. Everybody connected with the Company, so far as he knew, had been in favour of showing this public spirit. At all events, all those officials with whom he had had the pleasure of coming in contact had taken this view. The General Manager, Mr. Milne Watson, had been most enthusiastic, and had done all he could to help them in every possible way. He remembered some eighteen months ago suggesting to him that "G" company should be resuscitated and increased in numbers from the rather small dimensions to which it had then fallen. He had only to mention the matter to Mr. Milne Watson, and within a few months the company had increased almost threefold. He only referred to this incident in order to impress upon them how much in favour of this movement everybody connected with the Company was. Now, however, he came to the head and front of all—their host that day, Mr. Corbet Woodall, who was at that moment giving them incontrovertible evidence of the interest he took in them. Their best thanks were due to him for all he had done in the past; and they knew he intended to do all he could for them in the future, and help forward what might be regarded as an absolutely necessary safeguard for this country—that was, a national army. He would ask them to join with him in according a very hearty vote of thanks to their host for his great kindness in entertaining them, and to drink to his long life and good health.

The toast having been enthusiastically honoured, Mr. Corbet Woodall, after acknowledging it, remarked that he did not know that those present need concern themselves very much as to whether or not the territorial army was a success. They, at any rate, were men who desired to take their proper part in the maintenance of the security of their country. They knew quite well that if the territorial army was not a success, then those who had not shown, as those present had done, their personal interest in the question, would simply have to do so. If the territorial army was not a success, then compulsory service of some sort or another would certainly be instituted; and he would say, the sooner the better. He was certain, judging from what he knew of the volunteer force, that if similar drilling and self-sacrifice were imposed on all men, it would be a great thing for the country, and would do a lot to cure the trouble that distressed them so much in the winter—that of unemployment; for it would make a larger number of men physically strong, and fit for work. It had been a great pleasure to him to have them with him that day. He had always felt that if people did not get their pleasure in their work, they were very likely to go without it, as so much time was spent at work. He desired above all things to make work a pleasure, and to make it a pleasure to work.

Mr. Woodall's remarks were greeted with prolonged applause; and at their conclusion, the party spread themselves out over one of the lawns, where the afternoon was spent witnessing a conjuring entertainment, and listening to the first-class music of the band. Subsequently, tea was served in the tent, after which "B" and "G" companies beat a retreat—greatly impressed by the warm reception that had been accorded them.

In drawing to a close this notice of what was in every way a thoroughly pleasant function, it should perhaps be mentioned that in addition to what has already been referred to, the Company have at Beckton a Miniature Rifle Club consisting of about 350 members, who have of late been accomplishing some remarkable shooting.

PERSONAL.

Mr. Fred J. Dixon, F.G.S., Assoc.M.Inst.C.E., is about to vacate his appointment as Water-Works Engineer and Manager to the Borough of Harrogate to take up a similar position with the Ashton-under-Lyne, Stalybridge, and Dukinfield District Water Board.

At a meeting of the Bolton Water Committee last week, it was resolved that Mr. Lewis Mitchell, Assoc.M.Inst.C.E., be appointed Joint Engineer, along with Mr. R. H. Swindlehurst, M.Inst.C.E., of the water-works undertaking; the existing arrangements as to salaries of such officers to continue, at all events, for the present.

At a special meeting of the Bolton Corporation Gas Committee last Friday, the Chairman (Alderman Leonard Wild) reported that Mr. William Smith, the Gas Engineer, had been advised by his doctor to take a rest from duty for at least three months. The Committee granted Mr. Smith leave for this period; and the Chairman and Vice-Chairman (Mr. Webster) were deputed to make arrangements for carrying on the work during the Engineer's absence. We understand that Mr. Smith intends to spend a considerable portion of his holiday at Ayr, his native place.

At the conclusion of the business at the meeting of the Board of the Lewes Gas Company last Wednesday, the Chairman (Mr. C. R. Kemp), in a neat and appropriate speech, asked Mr. Levi Monk to accept a beautiful and valuable piece of plate, bearing the following inscription:—

Presented to Levi Monk

By the Directors and Secretary of the Lewes Gas Company on his retirement from the position of Manager, in appreciation of his services.

1894–1908.

Mr. Kemp expressed the wish that Mr. and Mrs. Monk might live long to look on the gift, with the knowledge that their stay in Lewes had been appreciated by all who knew them. Mr. Monk, who was quite taken by surprise, was too much overcome by emotion to adequately express his thanks; and he therefore intends to take a more favourable opportunity to acknowledge the gift, which came upon him so unexpectedly. Referring to the presentation, the "East Sussex News" says: "The Lewes Gas Company are this week losing a valuable servant in Mr. Levi Monk, who since 1894 has been Manager of the gas-works. The appreciation in which he has been held by the Directors and Secretary was shown by the testimonial presented to him on Wednesday; and the townspeople also have good cause to thank him for his exertions on their behalf. Mr. Monk's first duty has, of course, been to his employers, and that duty he has faithfully and ably performed; but he has never forgotten the consideration that is due to the customers of the Company. The townspeople will therefore share the regret of the Directors at Mr. Monk's departure, and both will join in wishing that gentleman every happiness in his retirement." Mr. Monk will be succeeded at Lewes by Mr. Edward Jones, who has for a number of years been his Assistant.

VISIT OF THE INSTITUTION OF GAS ENGINEERS TO BERLIN.

[By Our Special Representative.]

The visit of the Institution of Gas Engineers to Berlin, looked forward to with such pleasure by the members taking part in it, is now a thing of the past; but those who were fortunate enough to participate in it will ever retain the most favourable recollections of their excursion, which by common consent not merely equalled, but far exceeded, their expectations. Whether looked at from the technical or the social standpoint, or from the still more important view of the promotion of international friendship, success was complete. The key-note in the latter respect was struck by Mr. E. Körting in the admirable speech with which he welcomed the members of the English body at the dinner at which they were entertained by the German Gas and Water Association; and his remarks were appreciated the more because all knew and valued the way in which he had worked to that end, not only in word but in deed. The note thus sounded was heartily followed up by Mr. Doig Gibb, who expressed the thanks of the English guests in a manner that fully indicated the feelings of those present, who rejoiced to have an opportunity of meeting their German colleagues, many of whose names are as familiar to them as those of their own fellow-countrymen.

Journeying to Berlin.

The whole of the arrangements for the comfort of the visitors in their journeys and during their stay in Berlin were excellent, and went without a hitch; and even in matters which are beyond the control of the most perfect of organizations, circumstances favoured the excursion. Thus the capricious and inconstant Clerk of the Weather gave of his best; for though the last few hours of the journey to Berlin on Friday and the night following were very hot and close, a change came on Saturday morning, and from this time onwards the bright, fresh weather was all that could be desired—the heavy storms experienced in many parts of Germany on that day leaving untouched the neighbourhood of Berlin. To the relief of many of the members, too, the sea passage in both directions was quite smooth.

In anticipation of the visit, descriptions of the works inspected —namely, the Oberspree and Mariendorf stations of the Imperial Continental Gas Association and the Tegel works of the Berlin Municipality—have already been published in the "Journal" (*ante*, pp. 622, 692); while in 1904 (see Vol. LXXXV., pp. 469, 619, 686, 752, 829) a complete account was given of the Mariendorf works from the pen of the late Mr. E. Drory, Mr. Körting, and Herr H. Schüller. It is therefore altogether unnecessary now to enter into any further details in this respect; and attention may to-day be confined to simply giving a general account of the proceedings.

Visit to the Oberspree Works.

The members were met on Saturday morning at the Central Hotel by Mr. Körting, Herr von Oechelhaeuser, and Mr. A. F. P. Hayman, and taken in motor-cars to the works at Oberspree, where only the vertical retorts were inspected. Two beds, each containing twelve retorts, 5 metres in length, were at work; and the process of discharging and charging was closely watched by the party, all of whom were much impressed with the smoothness and ease with which the whole process was carried on. Only one man was employed per shift; and he first discharged the retorts, and then proceeded upstairs and charged them. Great interest was also taken in the construction of the retort-house, the roof of which is (as described in the article already referred to) supported from the buckstaves of the settings, as well as the ingenious method by which the buckstaves take the vertical load only, and are free to move in other directions without affecting the roof. The mechanism employed for opening and closing the bottom lids was examined; and though at first sight this appeared to be somewhat complicated, it was seen on inspection that the complication was only apparent, and that there was little or nothing likely to get out of order. On the upper stage were to be seen the arrangements devised by Mr. Körting for charging the nuts and small coal into the retort in separate streams, in order to lessen the pressure at the bottom of the retort during the earlier period of carbonization.

Inspecting the Mariendorf Works.

The journey was then continued in the cars to Mariendorf, where the party, which included many of the members of the German Gas and Water Association, were entertained at lunch by the Imperial Continental Gas Association. The guests were welcomed by Mr. Körting on behalf of the Directors, who trusted that they might find much of interest and of value in the works, which were the joint production of English common-sense and good commercial methods and German thoroughness in detail and scientific knowledge. The thanks of the guests were heartily expressed by Mr. Doig Gibb.

On leaving the luncheon-room to commence the inspection of the works, an unexpected interlude was provided. As the party came out, the works "bull" was heard, and a few moments later men appeared from various directions in full fire uniform, with hose and reels, followed shortly after by the arrival of others of the employees on their bicycles from the village, whence they had hurried at the sound of the alarm. A smart exhibition of fire and life-saving drill was then given; the water-cooling tower representing the flaming building. This being completed, a general inspection of the works was made, including the purifier-houses, the washer and scrubber and condenser houses, and the exhausting plant. The happy architectural treatment of the buildings was much admired, as well as the general disposition of the plant, which, while not arranged in such a manner as to render future extensions difficult, nevertheless allowed ample room for economical working. Most noticeable, too, was the great cleanliness and practically the entire absence of smell; no odour being perceptible even in the scrubber-house. The well-kept gardens, in which flowers of many kinds were flourishing, added considerably to the general effect. For those who had recently read the articles of Messrs. Drory, Körting, and Schüller (above alluded to), it was interesting to see how closely they had succeeded in putting into practice the principles which they had laid down for themselves at the outset in the construction of these splendid works.

Time, however, precluded more than a short inspection of the general features of the works, as all were anxious to reach the chief objective—the vertical retorts. Here the charging and discharging of the 5-metre retorts was again witnessed; and, as at Oberspree, the operations proceeded with the utmost ease and regularity. At Mariendorf, however, seven beds of twelve retorts each were at work, and two men were employed—one for discharging and the other for charging; but only two eight-hour shifts are worked, no retort being discharged during the interval of four hours between each shift.

In addition to these beds, however, a further novelty was seen in the shape of a bed with vertical retorts of much greater size than those used in the ordinary settings. The size of the bed is the same as in the case of the other settings; but instead of twelve retorts placed in rows of two, there are five retorts only, the horizontal section of which is also oblong—the width of the latter remaining the same as before, while in length it is so increased that the retort occupies almost the full width of the setting. Each retort is capable of containing about 34 cwt. of coal per charge; the period of carbonization being 14 hours. The mechanism for discharging the coal is similar to that used with the smaller retorts, except that, owing to the much greater weight of the bottom lids, it is no longer possible to open and shut these by hand, and hydraulic machinery has to be employed for the purpose. The discharging of these retorts was seen, as well as the successful manner in which the De Brouwer conveyor tackled the large mass of coke suddenly dropping upon it, and carried it away. These large retorts are still in the experimental stage; and the results so far obtained (as Mr. Körting informed the party) have not been equal to those given by the small retorts.

The march of time now necessitated the conclusion of this inspection; and, somewhat loth, the party tore themselves away from the retort-house, and, passing the house now being built for further benches of verticals, standing in skeleton against the sky, they reached the Teltow Canal, on the western side of the works, and inspected the coal elevating and conveying plant for transporting the coal from the barges to the stores or retort-houses.

The Teltow Canal.

Close at hand a special steamer was waiting for the party, who embarked and in glorious sunshine steamed down the Teltow Canal towards Wannsee. The canal, which is about 25 miles long, and has only been opened for about two years, connects the River Spree on the eastern side of Berlin with the River Havel on the western side, passing to the south of the city. Being of such recent construction, there are many points of interest about the canal to be noted. In place of the familiar towing-path, with horses patiently plodding along, a narrow-gauge overhead electric railway is provided on each side of the canal, along which small locomotives travel and tow the barges. Only one lock is required; but the construction of this aroused interest, especially on account of the numerous differences between it and the locks to which the English members of the party were accustomed. The familiar lock-gates are replaced by a sluice worked in a vertical direction by hydraulic power.

After passing the lock, which is situated at Machnow, a short halt was made for tea and coffee at an adjoining restaurant, after which the travel was continued into the Wannsee, where the steamer passed through the lakes formed by the River Havel among the beautiful scenery of the Grünewald.

Dinner at Wannsee.

On arrival at Wannsee, the party were most lavishly entertained by the German Gas and Water Association at a dinner presided over by Mr. Körting, in his capacity as acting President, which formed a happy conclusion to a day that will ever be memorable to those taking part in it.

Many members of the German Association present had joined the party at Oberspree and Mariendorf, and had travelled with

them to Wannsee. Among them were: Herr W. von Oechelhaeuser, Professor H. Bunte, Dr. Bueb, Dr. Karl Bunte, Dr. E. Schilling (Munich), Herr Silbermann (Berlin), Herr Elster (Berlin), Herr G. Wunder (Leipzig), Herr A. Weiss (Zurich), Dr. F. Schäfer (Dessau), Herr H. Prenger (Cologne), Herr K. Pfudel (Charlottenburg), Professor H. Drehschmidt (Berlin), Herr R. Bremer (Berlin), Mr. W. H. Lindley (Frankfort-on-Maine), and the following members of the Imperial Continental Gas Association: Mr. E. Körting, Mr. L. Körting (Hanover), Mr. A. F. P. Hayman (Berlin), Mr. W. Drory (Frankfort-on-Maine), Mr. James Drory (Aix-la-Chapelle), Mr. H. Salomons (Brussels), Mr. Brender à Brandis (Antwerp), Mr. A. R. Egeler (Vienna), Mr. Anderson (Hanover), Herr Ansbok (Vienna), Herr Pohmer (Berlin), and Mr. R. W. Wilson (London), the Secretary.

In accordance with the German custom, the few speeches made took place between the courses, and not after dinner. The loyal toasts of "The Kaiser" and "King Edward" having been drunk with enthusiasm by the representatives of both nations, Mr. Körting, proposing the toast of the "Institution of Gas Engineers," extended a hearty welcome on behalf of the German Association of Gas and Water Engineers to their British colleagues, and expressed the hope that what they had seen, or were still about to see, at Berlin would not only be of interest, but would also give them some information of value to take back with them—just as he and others in Germany, when returning from a visit to England, never failed to come back with many new ideas, together with a great admiration for the extent and steady expansion of the gas industry in that country, and of its excellent commercial methods. The attractions of England for the German nation were shown by the fact that there were very many thousands of Germans now living in London, including 10,000 to 20,000 waiters; whereas the number of English attracted to Berlin amounted only to about 1000, including governesses. The feeling, however, which on the present occasion lay nearest to his heart, and on which he wished more particularly to dwell, was the value of meetings such as these between educated men of two nations having a common pursuit in life, than which nothing was more calculated to bring about a better understanding, and avoidance of misunderstanding, between the nations. The study of history showed how much the German and British nations had in common in their past; and a visit he had recently paid to the National Portrait Gallery in Trafalgar Square, had impressed this upon him more deeply than ever. In this collection he had seen the portraits of men as celebrated in German as in British annals, and of those whose names were almost as familiar to all educated Germans as to Englishmen through reading the works of Scott and Macaulay. He trusted that this happy meeting might add a further bond of union to those already existing, and increase the feeling of brotherhood between the two nations, to their mutual advantage.

Mr. Doig Gibb, in reply, thanked Mr. Körting, on behalf of the members of the Institution of Gas Engineers, for the kind way in which he had proposed the toast. The members appreciated it, as he did himself; but he must take exception to one of the statements. Mr. Körting had led them to believe that the commercial acumen of the British nation compared favourably with that of the German. He ventured to disagree; and he submitted that he had proof on his side from Mr. Körting's own words. Mr. Körting had said that there were many thousands of Germans in London, including from 10,000 to 20,000 waiters; while in Berlin there were only about 1000 English people. Did not this show that the Germans could more successfully compete with Englishmen in London for their bread and butter than Englishmen could do in Berlin against the Germans? Mr. Körting had also said that he never came back from England without something good in a design which he had seen or machine which he had tested. He did not think Mr. Körting's acquisitions had been confined to those, because he probably never got a better prize from England than when he secured his present most able and courteous assistant, Mr. Hayman. They had that day had a judicious mixture of education and entertainment. They had been the guests of the Imperial Continental Gas Association, and they had seen the vertical retort installations which had such a fascination for every engineer among them. They had also had the good fortune to meet many gentlemen whose names were household words in England. They had met Herr Dr. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company, at whose more or less experimental works at Dessau the vertical retorts had their birth. They had, too, met Dr. Bueb, whose ability made that birth possible; and they had met another gentleman whose name was honourably known throughout the world of gas engineering—he referred to Dr. Bunte. He could not enumerate his eminent services to the gas industry, nor his many offices. He was, however, the Secretary of the German Association, whose guests they were; and he was also Editor of their Technical Journal. But he ventured to suggest that he was most gratefully remembered by the visitors at the present time by his courtesy—he might say international courtesy—in forwarding in time for the recent meeting of the Institution in London a copy of the report of the Committee of his Association on vertical retorts, and this before his own Association had had the report presented to them. They were that night enjoying the kind and thoughtful hospitality of the German Association; and he was reminded of the beautiful old Scottish tradition that friendship was sealed by the partaking of food (and drink) together. That night they could not but believe in this, and that now German gas engineers and English gas engineers were brothers, standing together hand in hand, and sharing sentiments which the name of brother suggested. But in Scotland relatives had certain rules, which were probably due to Scotch caution; and one of them was that even brothers must take their turn in entertaining. Although they, he was afraid, could not hope to equal the entertainment of that day, they still desired to be afforded the chance of doing so; and they trusted that, at no very distant date, the German Association would give them an opportunity of entertaining them in England. They would do their best; and if sincerity and a desire for true brotherhood would suffice, then they would succeed in what they would strive for. In conclusion, he asked those present to drink with enthusiasm, and with gratitude, the toast of "The German Association of Gas and Water Engineers."

At the conclusion of the dinner, the return journey to Berlin was made by train; but as the programme of the day had taken longer than was anticipated, the city was only reached at about midnight—too late for any organized survey of the public lighting. The members, however, had ample opportunity for examining this, both on the previous and subsequent evenings; and as it had been intimated at the dinner that the compressing station at the Gitschinerstrasse would be open to members on the Monday evening, most of them postponed their closer inspection until that date.

On Sunday, the visitors were left free to make their own plans—which they appeared to experience no difficulty in doing, with so much of interest to see. The majority eventually found their way to the Zoological Gardens, where they met what, from the crowded condition of the place, appeared to be a large percentage of the population of Berlin.

The Tegel Works.

By the invitation of the Berlin Municipality, a visit was on Monday morning paid to the new works at Tegel; motor omnibuses being provided for the conveyance of the party. On arrival at the entrance to the works they were met by the Director (Herr Schimming), and were at once conveyed in trucks, in which seats had been fitted, to the extreme end of the works, near the Tegelersee, and made an inspection of the huge coal-store and of the ingenious means of transporting the coal from the barges to the store, and from the store to the retort-houses. From there the party proceeded through the retort-houses, the architectural treatment of which far exceeded anything any of the visitors had previously seen. In these houses inclined retorts only are employed; and the discharging and charging of them was inspected. This was followed up by an examination of the condenser and scrubber houses, the exhausting plant, and the purifiers. In the latter department much interest was exhibited in a rotary plough, driven by a wire rope, by means of which the oxide is continuously turned over mechanically.

On reaching the main entrance, the party were invited to partake of light refreshments at the offices, after which an inspection was made of the portion of the works lying on the other side of the Berlinerstrasse. Here the greatest novelty to English eyes was a large holder enclosed within a building, the walls of which take the place of the ordinary guide-framing. The sulphate works were also examined in passing; and the party then returned in the conveyances to Berlin.

All were very much impressed with the great mechanical engineering ability shown throughout in the construction of these works, though naturally differences of opinion existed as to the advisability of the employment of machinery to such an extent, at any rate under English conditions. As a result of their visit, however, the members of the party had already realized how much difference there is between the conditions in England and those which prevail in Germany, and that what would be unsuitable for the former may be advantageous for the latter.

In the afternoon, some 23 members interested in water supply accepted an invitation by the Berlin Municipality to visit one of the large pumping-stations; the remainder making their own occupation for the time that was left to them before dusk.

The Public Lighting of Berlin.

When night fell, many of the members availed themselves of the invitation to visit the compressing plant for public lighting established on the municipal works at the Gitschinerstrasse. This has already been described in last week's issue (p. 843), in connection with the meeting of the German Association, and need not further be dealt with. A description of the lighting by the new high-pressure inverted lamps appeared at the same time; and this matter was the subject of a paper by Professor Drehschmidt.

Mr. Hayman, in his paper read at the recent Institution meeting, asked: "Where is it possible to find a better lighted city than Berlin?" Those who were in Berlin last week are now in a position to answer this question; and the unanimous reply is: "Nowhere within our knowledge." Wherever one went, even in comparatively unimportant streets, the lighting was excellent; but, of course, the greatest impression was made by the high-pressure inverted lamps in the larger streets—the number of which is being rapidly increased. The thoroughfares in which these lights are already installed are the Königgrätzerstrasse, Potsdamerstrasse, Wilhelmstrasse, Belle Alliance Platz, Lindenstrasse, and Markgrafenstrasse. All the gas consumed in these lamps is compressed at two central stations—the one already mentioned at Gitschinerstrasse, and the other at Weissenstrasse. The mains from each of these stations are connected together; and a third station is in course of erection. In addition to the

inverted lamps, 661 upright incandescent burners on the Millennium system are also supplied with their gas from the high-pressure mains.

The inverted lamps first installed, constructed by Messrs. Ehrich and Graetz, contained two burners only, each of which consumes, under a pressure of about 53 inches, some 42 cubic feet per hour. The total horizontal illuminating power of the lamps is given as 4000 Hefners, or about 3600 candles; so that the duty obtained is about 43 candles per foot. These two-burner lamps are, however, now being replaced by lamps having three inverted burners, each consuming 28 cubic feet of gas per hour and giving the same total amount of light. The reason for this change is that, owing to the long flame produced by the two-burner lamps, the breakage of globes due to local heating was considerable.

Information was given to the effect that at the present time 251 three-burner lamps are in use and 700 two-burner; while a further extension of 900 three-burner lamps is arranged for, when all the main streets will be lighted in this manner. The mantles are used uncollodionized, and are burnt off *in situ*, by means of the high-pressure gas. Thus a mantle is secured of a proper shape to suit the flame. The average life of a mantle was given as from six to eight days; one man being required to look after 40 to 45 lamps.

With regard to the lighting effect, there could be no two opinions. It is undoubtedly far superior to anything in the way of public lighting that has previously been seen. Probably the most impressive method of ascertaining the difference is to walk down the Friedrichstrasse, which is lighted by centrally hung electric arcs, towards the Belle Alliance Platz. As the incandescent lamps in the latter come in sight, it is seen how these, in spite of their much greater distance, completely outshine the nearer electric arcs. The streets lighted with these gas-lamps are almost flooded with light, which is distributed very uniformly, not only on the horizontal but also on the vertical surfaces, with a complete absence of dark shadows—rendering it, as one member remarked, possible to find a dropped coin with ease at any spot. Everyone present would have liked to congratulate Herr Bremer, who is in charge of the public lighting of the city, on the great success of the installation; but unfortunately he was unable to be present to meet the party on the Monday evening.

The Return Home.

The return to England was commenced on Tuesday morning, the railway journey being performed under much pleasanter weather conditions than on the previous Friday. After a smooth passage, Liverpool Street was reached punctually at eight o'clock on Wednesday morning, when the party separated to resume their ordinary vocations.

All felt that the trip had formed one of their most enjoyable and profitable experiences, and expressed gratitude for the hospitable manner in which they had been entertained by their German colleagues, and heartily echoed the wish uttered by Mr. Gibb at the dinner, that an opportunity might soon occur for a return—in some measure, at any rate—of this hospitality.

Where all had worked so heartily for the entertainment of their English friends, it might seem somewhat invidious to mention any names; but it would be impossible to conclude this account without expressing the great obligation which all acknowledged to the Acting President of the German Association, Mr. E. Körting, for the excellent manner in which the arrangements for the visit were made by him, and for the cordial reception he gave to all the members, and to Mr. Hayman, for his unwearying efforts to ensure the comfort and enjoyment of the party during their stay in Berlin. One must also not forget those responsible for making the necessary arrangements on this side of the water; and in this connection thanks are more specially due to the Hon. Secretary of the Institution, Mr. S. Y. Shoubridge, whose work was none the less effective, nor the less appreciated by the members, because it was so unobtrusively carried out.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

THE THIRTY-FIFTH ANNUAL CONGRESS.—Paris, June 23 to 26, 1908.

REVIEW OF THE PROCEEDINGS.

[From Our Own Correspondent.]

There was a large gathering in the vestibule of the Société des Agriculteurs de France, in the Rue d'Athènes, at the opening of the Thirty-Fifth Annual Congress last Tuesday morning, under the presidency of M. André Coze, of Rheims, who has held office for two years. The time fixed for the meeting was nine o'clock; and a few minutes after that hour the members were summoned by the President's bell from their fraternal greetings to the fine hall of the Society, for the transaction of what may be called the preliminary business of the Congress. When they were all assembled, it was seen that there was a goodly gathering. Upon the platform with M. Coze was the Treasurer (M. Marquisan), the Permanent Secretary (M. Payet), and several members of the Committee.

Ordinary General Meeting.

The first business was the adoption, by show of hands, of the report of last year's proceedings at Nancy; and then came the voting for members of the Committee. Four—viz., MM. Bigeard, Bouvier, Gardiner, and Godinet—were eligible for re-election. Last year M. Lemerle stood for membership of the Committee; but he gave way in favour of M. Delebecque, who was a Director of the Nancy Gas Company. The Committee now recommended M. Lemerle. Members then proceeded to deposit their papers, and Scrutineers were appointed to examine them.

The President next read the report of the Committee, the opening paragraphs of which were devoted to a recognition of the work of the four members who during the year had been removed by death. Though "implacable destiny" had to an extent not affected the members of the Society, there was none the less keen regret on the part of their colleagues who had been spared for those who had been taken. Almost on the morrow of the last congress, the Committee received the sad news of the death of M. Charles Mariez, the Manager of the Nancy Gas Company, who had shown so much interest in the congress, but who, on account of ill-health, was compelled to absent himself from the pleasant gatherings connected with it. Having given a sketch of the career of the deceased, and especially of his work at Nancy, the Committee passed on to refer to M. Brouardel, Director-General of the Compagnie Française du Centre et du Midi, who died suddenly on the 12th of May. He was a member of the Committee of the Society, and his ability combined with his kindly disposition heightened the regret of his colleagues at his death. The third member taken from the ranks of the Society was M. Léopold Gaulet, who first became a member of the Board of the Maubeuge Gas Company in 1893, and subsequently filled the positions of President and Managing-Director. He devoted himself entirely to furthering the interests of the Company. Quite recently, the Society had lost M. Charles Bosquet, who, after holding for a time the post of Manager of the gas-works at Rostoff, obtained that of General Manager of the Rio de Janeiro Gas Company. This, however, he relinquished, and returned to France—becoming Engineer of the Compagnie Continentale des Compteurs. It was while holding this position that he was taken ill; and he passed away on the 11th of June. Death and other causes had reduced the number of members; but adding those whose names had been submitted and approved, the total stood: Honorary members, 22 (among them being Mr. W. Doig Gibb, Past-President of the Institution of Gas Engineers); ordinary members, 582; associates, 125—total, 729. In addition to the death of M. Brouardel, the Committee had sustained a loss by the retirement of M. Thibaudet on account of ill-health; and the members would have to replace him. The Committee next gave a list of the contributions made to the funds of the Society by various gas companies—ranging from 2400 frs. (£96) by the Compagnie Centrale du Gaz (Lebon et Cie.), down to several donations of 50 frs. from smaller concerns—the total being 24,750 frs. (£990). The Committee expressed their thanks to the donors for these testimonies of their interest in, and appreciation of, the work of the Society. By their continued generosity, as well as by their much-prized encouragement, upon which the Committee hoped they would always be able to rely, they had been enabled not only to help the Society to fulfil its mission, but to undertake investigation work from which the greatest good was expected. The Committee then enumerated the various objects of the Society's expenditure in directions which it was believed would be profitable to the gas industry, including the production of the "Revue Bibliographique" of which the members had received two numbers; the presentation of a gold medal to the Photometry Laboratory of the Faculty of Sciences, in recognition of the work undertaken there in testing the incandescent burners submitted at the annual congresses; a contribution to the works of the Comité Français de la Commission Electrotechnique Internationale, with the view of arriving at a unification of electrical nomenclature; and in taking adequate measures to ensure French participation in the work of the International Commission on Photometry, the second sittings of which took place last July. Consequent thereupon was the organization of a conference on the subject of the unification of screw-threads, the results of which would be brought before the members at a later stage of the congress.

The next business was the reading by M. Marquisan of his

report on the financial position of the Society. It showed that the revenue was 62,368 frs. (£2495), and the expenditure 54,363 frs. (£2175). The latter included 9640 frs. (£386) on publications, 8919 frs. (£357) on prizes, and 1074 frs. (£43) on the library. The report was adopted.

It was then announced that the ballot for new members of the Committee had resulted in the election of MM. Lemerle and Monthiers; and the President briefly welcomed them. This brought the morning sitting to a close.

At the opening of the proceedings at the afternoon sitting, the President announced that at the close of the business in the morning the Committee proceeded to the election of the members of the "bureau" for the year 1908-9, with the following result: President, M. Godinet; Vice-President, M. Marquisan; Secretaries, MM. Boutan and Gaston Gautier; Treasurer, M. Frère. He congratulated these gentlemen on entering upon their new duties. M. Coze next announced that M. Cruppi, the Minister of Industry and Commerce, was unable to be present, as had been expected, to distribute the medals awarded to the Society by the Government.

President's Address.

The President then proceeded to give a summary of the work of the year. He said it was particularly agreeable, in opening the congress, to note the presence among the members of persons engaged in the gas and other industries coming from distant places to support, by their scientific skill and special knowledge, and take part in the work. This event was due to the wish expressed by the members at the meeting at Nancy last year on the subject of the unification of screw-threads in appliances for the utilization of gas. The promptitude with which their foreign colleagues had responded to the request addressed to them on the subject was exceedingly gratifying; and the Committee cordially thanked the various groups with which they had been associated, and welcomed their delegates—viz., Mr. W. H. Lindley, representing Germany; Messrs. Thomas Glover and James W. Helps, England; MM. E. Prisse and Busine, Belgium; M. Krafft, Italy; Herren Meystre and Weiss, Switzerland; and Messrs. Laurence Bonet and A. G. Glasgow (whom Heer Van der Willigen had been good enough to replace), America. He should be guilty of great ingratitude if he did not recognize the assistance they had received from M. Marre, President of the establishments of Barriquand et Marre, through whom the French delegates had arrived at a basis for discussing the question. He hoped and believed the labours of the Commission would be productive of important results. Before leaving this subject, he must not, bearing in mind the origin of the Commission, omit to thank M. Vautier, the President of the International Commission on Photometry, for having brought about the event upon which he (the President) was now congratulating himself. It was owing to his advice and suggestions that the negotiations were entered upon which had led to the conference now taking place.

The next subject dealt with by the President was the prolongation of the law of July 13, 1906, on the subject of the weekly rest-day, which had been referred to him by the Society, and had also been considered by the Syndicat Professionnel. He thought it was his duty to furnish the members with some precise information on the subject, to which he had alluded at the preceding congress. There was no doubt that the law had imposed fresh charges and new duties on gas companies; and what rights could they take advantage of in return? It was difficult to say, as the regulation upon which they had to depend had not been published. Having referred to certain details of the operation of the law in connection with gas undertakings, the President said it would rest with the competent tribunals to overcome the various difficulties which might possibly arise from the divergent interpretations of the law. This subject naturally led to another also bearing upon labour—viz., the formation of a benefit society for employees in gas-works, particulars of which have already been given in the "JOURNAL" (see *ante*, p. 561). The President gave some details of the scheme, but said he did so only to prove that the question had been thoroughly studied, and that it would be possible for the members to adopt, in all confidence, the system proposed, in regard to which the Committee had from the first received much encouragement.

Turning to technical subjects, the President referred to an innovation which he believed would be attended with profit to the members—viz., the publication of the "Revue Bibliographique," already alluded to, the issue of which would appear every quarter, and would furnish summaries of articles of interest to the industry, especially those appearing in publications which did not come into the Society's library. The task of editing the publication was an arduous one; but the Society had been assured of the co-operation of M. Payet, who was better prepared than anyone else to bring so delicate a task to a successful issue. As bearing upon the subject of the literature of the gas industry, the President here announced that, as the result of the liquidation of the Paris Gas Company, the Society had become the possessors, as by a testamentary bequest, of a highly important portion of the archives recording the work done at the experimental station of the Company at La Villette, including a number of reports drawn up by M. Emile Sainte-Claire Deville, the modest and distinguished *savant* whom all gas engineers knew, and whose great affability was appreciated by them no less than his high competence. Having enumerated the works to which he had referred, the President said the Committee hoped, sooner or later, to make this valuable collection of literature profitable to the members by having prepared either an analysis or a *résumé* of the memoirs of which he had given an outline. Meanwhile, they had decided to present to M. Sainte-Claire Deville (the Engineer-in-Chief of the station) a gold plate, bearing the sign of the Society, accompanied by a diploma recording the nature of the award. M. Coze added that he was sure the members would unite with him in expressing their congratulations to the distinguished recipient of the award, to whom he had the pleasure of personally handing it. [At this point M. Sainte-Claire Deville stepped up to the front of the platform and received the gifts amid applause.] This award, continued the President, inaugurated the series about to be commenced by the reading of the report on the subject of the competition for small gas-engines instituted last year. In referring to this competition, which doubtless would have to be renewed, he must direct attention to the broad lines of the work of the Committee, as well as of the "bureau," during the year. He trusted that, as had been the case with the work of the Society in the past, that of the congress now opening would contribute to the prosperity of the Society; and he associated with this wish all the similar Associations in other countries.

The President concluded by referring to the intended visit of some of the members to London in order to see the Franco-British Exhibition and study its Gas Section. It was hoped it would furnish information which might be useful in view of the preparation of their own projected International Gas Exhibition. If the realization of this scheme had been suspended by the force of events, the idea had not been abandoned, persuaded as they were of the excellent results which would follow. The excursion to England promised to be most agreeable; their amiable British colleagues understanding so well how to carry out with so much charm the laws of hospitality. The members would no doubt bring back with them much that was in the highest degree profitable to their respective undertakings. In the gas industry, efforts towards progress might be of an international order; and advantages could not but result from an *entente amicale* between gas engineers of all countries, to whom, at the opening of their thirty-fifth congress, the Society offered a fraternal greeting.

Awards of Medals and Premiums.

The next business was the presentation of the medals awarded by the Government to gas-works employees for long and meritorious service. There were fourteen recipients of these distinctions; fifteen, of the Society's silver medal; and thirty-one, of their premiums of 200 frs., for which there had been 102 candidates. Of the last-named group, 49 had given more than 32 years' and 87 more than 30 years' continuous service; only the remaining one having worked for less than 25 years.

M. Godinet then read the report on the prizes awarded for the best communications presented at last year's congress. Of the fourteen papers then read and discussed, the Committee selected two, the merit and utility of which they thought deserved recognition by the award of the prizes reserved for the authors of the best memoirs. They were the contributions of M. Casaubon and M. Camille Roche. The paper by the former was entitled: "Researches into the Nature of Diffusion in Gas-Flames;" that of M. Roche: "Suction-Gas Generators: Advantages and Inconveniences of Chemical Purifiers for Poor Gas."* The Committee gave summaries of both papers, and concluded their report by stating that they had awarded by M. Casaubon a prize of 400 frs., and M. Roche one of 200 frs. The former was not present; but the latter advanced to the platform and received his prize at the hands of the President. Another award was a silver medal and a diploma to M. Bablon, for his governor. M. Godinet also made a communication on the subject of the competition for an incandescent burner. One had been submitted which did not possess any new feature of construction. Three models were tested according to the directions. The tests were made at pressures increased by 5 mm. from 40 mm. up to 85 mm.; and the luminous intensity varied from 3·7 to 7·2 carcels (35·5 to 69 candles), according to pressure, for No. 1, of low consumption; and from 6 to 13 carcels (57·6 to 124 candles) for the others. At about 80 mm. pressure, the maximum intensity was 7·2 carcels (69 candles) for No. 1, and 11 to 13 carcels (105·6 to 125 candles) for Nos. 2 and 3. The consumption per carcel-hour dropped from 20 litres (0·7 cubic foot) at 40 mm. pressure to 15 litres (0·53 cubic foot) at 60 mm. to 70 mm; and it remained practically the same when the pressure reached 80 mm. These results were regarded as being much lower than those obtained with most incandescent burners; but it was pointed out that they were the outcome of a test with gas doubtless very different from that supplied by the English companies. This circumstance may have so modified the flame that its form did not adapt itself to the shape of the mantle. But it must not be concluded that the burner is a really inferior one. It was thought that the maker should ascertain whether a special regulation would improve the results obtained with it.

M. Payet then read a report on the competition organized by the Society in connection with small gas-engines. The idea originated with M. Gustave Gautier, of Nantes; and in order to carry it out all the firms making gas-engines were circularized. Though numerous promises were received, only ten candidates put themselves in a position for undergoing the trials. The conditions laid down appear to have militated against some of the

* A full translation of M. Casaubon's paper was given in the "JOURNAL," Vol. C., pp. 37, 105, 166; and that of M. Roche was noticed in Vol. XCIX., p. 100.

engines. At all events, only one candidate submitted a motor which seemed to be quite the right thing, and it worked excellently under trial. Its consumption with a full load was only 796 litres (28 cubic feet) per horse-power-hour—a result so much the more remarkable as the motive force developed was only 2·42 H.P. [Particulars of the trials of this motor were appended to the report.] In the presence of these results, the Committee do not doubt that in the future the lines they have indicated will serve to initiate a series of most interesting studies, alike for gas-engine makers and the gas industry. They have thanked all who took part in the trials, and have invited them to participate in a new series to be arranged at some future date. Meanwhile, they consider that the success attained by M. Bauchet deserves some recognition; and they have awarded him a silver medal, with a diploma.

The last report to be submitted was one on the subject of the unification of the dimensions of fire-bricks and fire-clay retorts; and it was read by M. Godinet. In it the Committee suggested the advisability of sending to all the members of the Society the dimensions they recommended, and advising them to order bricks and retorts of these sizes only. If this were done, makers would have to comply with the demands made upon them.

Technical Papers.

The reading and discussion of papers (of which there were thirty on the programme) was then commenced. The first was by M. Paul Coze, who described a special kind of truck for the removal of the hot coke from the retorts to the quenching-ground. It was a brief communication, and did not evoke any remarks. The next was a short paper in which M. Maggioni dealt with the subject of the value of special isolations in gas-furnaces. At its close, a few questions were put to the author by M. Godinet, who referred to what M. Euchène and the Germans had done in this direction; and M. Maggioni briefly replied. M. Marcou followed with the description of a patented arrangement of retort-setting which he claimed would facilitate drawing. He summarized his paper, assisted by a blackboard sketch. Beyond a few questions by the President, there were no observations upon the subject. The most important paper of the afternoon was the one taken last, the author being M. Echinard, and the subject "The Application of Tar to Regenerative Furnaces." It led to a good discussion, at the close of which the meeting stood adjourned.

Half-past eight was fixed by the programme for resuming the proceedings on Wednesday morning; and within ten minutes of that time the President was inviting the attention of the members (there were not many present) to the first of the twelve papers put down for consideration in the three hours at disposal. Before noticing them, however, it should be recorded that upon the platform, to the right of the President, were seated Mr. T. Glover and Mr. J. W. Helps, the English delegates to the conference on the International Unification of Screw-Threads.

The first paper taken was one by M. Charles D'Auberton-Carafa, on "The Distribution of Gas at High-Pressure." He described therein, by the aid of a plan and diagrams, an installation of high-pressure gas supply in a number of communes in the upper parts of Lyons, on both sides of the Saône. The scheme was formulated in 1906, after the conclusion of a concession under which the Lyons Gas Company took the place of a small local concern for supplying gas to Neuville-sur-Saône; the Company at the same time obtaining powers for lighting several other communes situated between Lyons and Neuville. It is unnecessary to deal here in detail with the paper, of which a full abstract translation has been prepared. The prints distributed contained a typographical error in the shape of a transposition of columns in a table, which militated against clearness; but it was promptly detected and pointed out by M. Delahaye. The next paper was a short one read by M. Camille Roche, who dealt with the flow of fluids through small orifices, and described an apparatus which has been applied to "Standard" washers, to the regulation, by displacement, of the tar employed for supplying the retort-furnaces, the spraying of ascension-pipes, and the conveyance of steam under the hearths of generators. After a few remarks on the paper by the President had been answered by M. Roche, M. Louis Chevalet offered some criticisms which were decided to be irrelevant. M. Godinet seemed to think there was a danger of the orifices becoming obstructed. M. Roche read another paper, in which he furnished some interesting results obtained in the operation of motors working with poor gas. A subject of importance to suppliers of gas on the Continent was dealt with by M. Charles Bachelay, whose father showed a device for levelling and fixing wet meters. No remarks were made on the subject. The next paper in order was one by M. Denayrouze, who wished to bring before the members a method of utilizing for incandescent lighting hydrocarbons extracted from coal tar. The President expressed the opinion that the paper was valueless as a contribution to the proceedings of the Society, inasmuch as the author did not tell the members anything new, nor did he give them any results. M. Denayrouze submitted, with some warmth, that the subject was of interest, inasmuch as by his system gas undertakings would be able to profitably utilize their tar; and he produced, and wished to have handed round for inspection, bottled samples of pitch and his extract from it. The President said he did not wish to depreciate the value of the paper, but he thought the Society required to have results which could be discussed. M. Mallet suggested that the communication was really intended to introduce a lamp devised by M. Denayrouze. Thereupon, a little "breeze" arose, on the subsidence of which the President left the chair to attend the conference above referred to, which was being held in another part of the building.

The rest of the business at the sitting was conducted by M. Godinet, the President-Elect. The next paper was read by M. Bachelay *père*, who described a simple arrangement (devised, it was stated, by his son) for so fixing lighting appliances to ceilings as to prevent accidents. M. Berthelon followed with an explanation, by the aid of a meter, of an appliance for enabling gas to be shut off automatically from a distance by means of compressed air. By the use of this apparatus, which the author has patented in association with M. Debrie, merely pressing a button in a room will close the meter; while a similar operation will restore the supply of light and heat. The appliance is called "Le Securitas;" but there seemed to be an idea in the minds of some of the speakers that its employment would not ensure that immunity from danger which its name would lead one to suppose. However, the remarks were of a good-humoured character, as they provoked considerable laughter. M. Métivier followed with a description of an apparatus, worked by electricity, for carburetting gas by benzol [see p. 943]; and M. Guillet gave an account of a remarkable deposit of sulphur in some supply mains. As the result of enlarging a portion of the distributing system, some of the pipes taken up were put aside for cleaning and use again. While this was in progress last April, the inner surface of the pipes was found coated with a greyish crystalline crust, which melted and burst into flame on the application of heat, and gave off the characteristic odour. It was calculated that something like 300 kilos. (nearly 6 cwt.) had been deposited upon the sides of the pipes taken up. The author thought it might be supposed, as furnishing an explanation of this deposit, that the small quantity of oxygen always found in coal gas caused oxidation of the inner surfaces of the pipes—the process being favoured by the humidity constantly present. These oxidized surfaces acted in much the same way as oxide of iron in the purifiers, either on the traces of sulphuretted hydrogen which had not been taken out by the most careful purification, or on gas which had been badly purified as the result of some failure of the plant. The pipes in question had been in position for at least forty years. M. Guillet read a second paper on a rather more practical subject—viz., the utilization of the ammoniacal liquor produced in small gas-works. He suggested two solutions of the problem; one being the treatment of the liquor by sulphuric acid in the works, with the subsequent production of sulphate of ammonia. But it was pointed out, by M. Mallet, that there was not usually upon the works a chemist competent to use sulphuric acid. The second solution was to produce a liquor which could be transported—in other words, to produce in a rotary washer ammoniacal cyanide sludge which could be afterwards treated, at the purchasing works, with sulphuric acid in the cold, by a process described in a communication presented to the Society in 1902. But M. Mallet remarked that in warm countries the water to be used would be too hot; and if considerable quantities were required, the apparatus would have to be made larger. The last paper set down for the morning was one in which M. Bromham described a regulator for the primary air supply to generator furnaces. The author did not read his paper, but explained the arrangement by the aid of a diagram. He stated that the saving in fuel effected by the use of the regulator in the course of two trials, each extending over 48 hours, was 15 per cent. on that used during the trial with the primary air admitted by a constant opening. At the Louvain Gas-Works, twelve of the regulators have been in operation for six months; and the manager states that his saving is at least 10 per cent. An installation is about to be put up in the Forest (Brussels) works of the Continental Union Gas Company.

There was no sitting on Wednesday afternoon; so the reading of papers was resumed on Thursday morning, shortly after nine o'clock. The first one taken was by M. Méker, who described his new types of incandescent burners, and answered several questions by the President as to the height of the chimney and the size of the holes. He had not given the results of any tests; and it was suggested that he should do this in a paper for the next congress. M. Méker was followed by M. Thomine, who read a short paper on the Keith system of high-pressure lighting; and referred to the illumination of the grounds of the Franco-British Exhibition and the improved lighting of London Bridge and other parts of the City. He also gave a description of Wright's gas-heated radiators. M. Pierson followed with a few figures in regard to the cost of electricity produced by engines worked by ordinary coal gas. A contractor undertook to supply current at Tours at 39 c. per kilowatt for four years. The installation had cost 15,000 frs., which it was desired to pay off by the saving effected by getting the current at 39 c. instead of 75 c., the price charged by the local suppliers for more than 10,000 kilowatts. The total profit in the four years came to 17,658 frs. (£707), of which the contractor took 2470 frs. (£99), and the rest went into the municipal treasury. M. Henri Roger followed with a short paper in which he described an arrangement (which was on view in the vestibule) for automatically lighting up luminous signs. A more interesting paper was the next, in which M. Defoy dealt with the lighting of railway carriages by compressed gas. The author is one of the Engineers of the European Gas Company at Havre, under M. Gaston Gautier; and his paper was a supplemental one to that presented by M. Naudé at the congress at Havre in 1905. He also submitted a note on the effect of the

extraction of cyanogen on the purification of gas, on which the only speaker was M. Lhomme.

M. Godinet replaced M. Coze at this point, and called upon M. Louis Chevalet to read a short paper on heating gas-works lavatory basins by means of thermo-syphons. Then followed a paper by the same author, in association with his father, on a washer for the production of naphthalene in the hydraulic main. Briefly stated, the system is a modification of the Chevalet washer-condenser, so that the washing-plate is constantly immersed in the oil. Into a balloon of 2 litres ($3\frac{1}{2}$ pints) capacity, half filled with ordinary water, there are dropped 50 grammes of oil; and then the balloon is attached to a Liebig refrigerator of large diameter. The water in the balloon is made to boil slowly; and that which condenses in the refrigerator allows the naphthalene to deposit. The authors directed attention to the importance of the hydraulic main as a remover of naphthalene; they having found the tar to contain, on an average, 10 per cent. by weight of this substance. They said they were persuaded that in many works, in order to obviate the production of naphthalene, all that was required was to keep the hydraulic main at a temperature not exceeding 45° to 50° C. (113° to 122° Fahr.), and more particularly to prevent the gas issuing from the ascension-pipes bubbling in the tar; also to seal the dip-pipes in water and not in tar. By the method described, the authors claimed that not only could the production of naphthalene be prevented, but tars of a higher market value obtained. M. Malet congratulated them on the process described, which he said was found to work very effectively in practice. M. Du Pasquier explained that he removed naphthalene with a washer and anthracene oil by the Bueb process; and M. Guillet added some few remarks on this process. M. Chevalet, sen., having offered a few observations, M. Du Pasquier gave an abstract of a paper he had prepared on the process to which he had referred. The principal speaker on this paper was M. Sainte-Claire Deville. His point was that tar at a tolerably high temperature gives off naphthalene, but retains the greater part of it if kept cool. Consequently, there would be no need to employ naphthalene washers if the tar could be maintained at a sufficiently low temperature to hold it. This, however, was not possible in actual working. The gas should be cooled as soon as practicable after leaving the hydraulic main. M. Godinet spoke favourably of washing by both oil and tar; and with a reminder that this was a subject set down for discussion at a later stage of the congress, the morning sitting closed.

On the re-assembling of the members in the afternoon, they found the hall had been darkened to allow M. Marquisan to discourse. with the aid of lantern slides, on "New Methods and Appliances for the Distillation of Coal for the Production of Illuminating Gas." It stood first in the list of papers; but the communication had not been printed. It will probably be remembered that a short time ago M. Marquisan read a long paper on the same subject before the Society of Civil Engineers of France; and an abstract translation of it was given in the "JOURNAL" for the 9th inst. (p. 629). His discourse on Thursday was on these lines. At the outset, he referred to the attempts which have been made at various times to improve the conditions of labour in gas-works, and dealt successively with the inclined retorts introduced by the President, the projector method of charging, and the several systems of vertical retorts, full particulars of all of which have appeared in our columns. Coming to the latest arrangement of vertical retorts—that devised by Messrs. Woodall and Duckham—M. Marquisan showed the earlier setting, and also the system as at present installed at Poole, and indicated the modifications which had been made. The discourse occupied about two hours. At the request of the President, Herr Weiss, of Zurich, gave the results of the working of ten beds of vertical retorts there, as published in the last number of the "JOURNAL" (p. 847), for which he was thanked. Another sitting of the Commission on Screw-Threads called the President away at this point, and he was replaced by M. Godinet, who called upon M. Freyss to read his paper on his trials of vertical retorts at Dessau and Oberspree, undertaken by him last year, in association with M. Cesari, for the Continental Union Gas Company. M. Maggioni gave a few particulars of the working at Trieste, and remarks on the general subject were made by MM. Lacaze, Marcou, Guillet, and Godinet. The last-named gentleman briefly summarized them, and expressed the opinion that the English settings possess certain advantages compared with the others. The next subject considered was that of lighting and extinguishing lamps at a distance. It was introduced by M. Lhomme.

On Friday morning, M. Delahaye was called upon by the President to offer some remarks upon the paper for which M. Casaubon had been awarded a prize of 400 frs.; and the author furnished some explanations, assisted by a diagram put upon the blackboard. There were only three papers remaining—one on direct heating by gas and another on some recent appliances for lighting by gas, by M. Laforgue; and the third on the Kilchmann and Gaulis apparatus for the automatic extinction of gas-burners, by M. Gaulis. They were, however, passed unread, and the members turned their attention again to vertical retorts; among the contributors to the discussion being M. Guillet, M. Sainte-Claire Deville, M. Faure, Herr Weiss, and the President. The remarks of M. Sainte-Claire Deville bore mainly upon the quality of the coke, which Herr Weiss said was harder than that of ordinary coke. The next subject was the ever-present one of the production of naphthalene and the means of preventing it. The principal speaker was M. Sainte-Claire Deville, who offered some remarks supplementary to those made the previous afternoon, and emphasized the importance of keeping the naphthalene in the tar. Herr Weiss suggested that the speaker should make some special investigations into this subject, and submit the results at the next congress. This was supported by M. Godinet, and appeared to be generally approved.

M. Vautier, whose name is so closely associated with the work of the International Commission on Photometry, followed with a summary of the proceedings at the sittings which took place in Zurich last year (fully noticed in our columns), and placed upon the blackboard the following table containing the figures given in M. Laporte's communication to the Congress, published in the "JOURNAL" for the 30th of July (with the addition of those for the *bougie décimale*), showing the value of the intensity of the light of one lamp in terms of the others:—

—	Carcel.	Hefner.	Vernon Harcourt.	Bougie Décimale.
Carcel	1	10·75	0·980	9·61
Hefner	0·093	1	0·915	0·89
Vernon Harcourt. .	1·020	10·95	1	9·80
Bougie Décimale. .	0·104	1·12	0·102	1

M. Vautier thanked the Société Technique for the support they had given to the important work carried on by the Commission.

The Unification of Screw-Threads.

During the proceedings on Friday morning, the President announced the result of the labours of the Commission on Screw-Threads. He first of all directed attention to a fine collection of standard threads and screws, meter connections, &c., used in the United States, which had been presented to the Society, by the American Gas Institute, through the intervention of the two American delegates to the conference. They were on view on a table in front of the platform. He again mentioned the names of the members of the Commission, referred to the difficulties which had been encountered, owing to the different languages of the delegates, and acknowledged the willing assistance which had been rendered in order to remove them. Much valued help was given by M. Benét, the representative of Hotchkiss et Cie., as well as by Heer Willigen, the Brussels representative of Messrs. Humphreys and Glasgow, and Mr. Pierson, as interpreters. The result of their deliberations had been: (1) The adoption of an angle of 60° for threads, with a $\frac{1}{8}$ cone-shaped end, for screws, on the Sellers American system. (2) The adoption of the following diameters and threads for the dimensions of 11 mm. (0·44 inch) and upwards:—

Diameters in Millimetres.	Threads in Millimetres.
11, 13, 17	1·4
21, 26·5	1·8
33, 42, 48, 52, 60	2·3
70, 73, 76, 89, 101·5, and 114	3·2

(3) Adoption of conic junctions, as in England and the United States. The Commission suggested the holding of a meeting six months hence, in order that the different members might by that time have had an opportunity of submitting the foregoing conclusions for the approval of the bodies who had delegated them to deal with the subject. The proposals were adopted.

Before closing this review of the business of the congress, the preparation of which was facilitated by the courtesy of M. Payet, the Secretary of the Society, it may be mentioned that among those present during some of the meetings were Mr. R. S. Gardiner, a Director of the Continental Union Gas Company and a re-elected member of the Committee of the Society, Mr. Edwin Bode, one of their officials, and Mr. Walter B. Brady, the Assistant-Secretary of the European Gas Company.

Visits and Banquet.

On Wednesday afternoon, about 120 of the members went by tramway to St. Denis, where they first visited the Abbey, and were shown the tombs of the Kings of France, and afterwards inspected the works of the Compagnie Française des Métaux. The visit was a most interesting one; the preparation of the metals in all their applications being clearly demonstrated. M. Coze thanked the Directors of the Company for granting permission to the members of the Society to go over the establishment, and laid stress upon the fact that entrance to workshops was very difficult to obtain. On Friday afternoon, the members went to Bezons, and inspected the works in which are made the electric cables of the Société Industrielle des Téléphones. On their return, they and their lady friends assembled about nine o'clock in the hall in which the meetings had been held, and enjoyed a varied and interesting *soirée artistique*. This review of the proceedings at the congress must not end without reference to the subscription banquet, which took place in the gorgeous restaurant of the Grand Hotel on Thursday evening, and at which there was a large attendance. It was expected that M. Cruppi, the Minister of Commerce and Industry, would preside; but he was unable to be present, and his place was taken by M. Sornay. During dinner, a selection of music was played by an orchestra under the direction of M. Henri Vanderzanden. After dinner "glasses were raised" to several appropriate toasts, proposed by the President and others. On Saturday, the Nanterre Gas-Works were open to any of the members who cared to inspect them; and the next day a large party of them started upon the visit to London, which was reached in the evening.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 957.)

LAST week—the last complete week of the half year—was a rather humdrum and uninteresting one on the Stock Exchange. Business was very quiet and destitute of salient feature; and things were inclined to droop without any particular reason why this should be so. The account had something to do with this, perhaps, for it was rather heavy; and one small failure was announced. The opening day showed markets to be very somnolent, with slight and irregular movements. The gilt-edged class was steadied by cheap money, though Consols had a small set-back. The more speculative lines were weaker. Tuesday was thoroughly dull and mopish, and prices all round yielded to depression. On Wednesday, the best-class securities were still under a cloud; but in the American and South African Markets there was a gleam. Thursday brought some indication of a coming turn for the better; choice investment lines strengthening their position, and Consols rising ¼. On Friday, the favourable tendency was confirmed by a further advance in the gilt-edged division, a recovery in Rails (which had been very poorly), and some amendment in the dangerous American Market. This better tendency was maintained on Saturday, so that the close was favourable. In the Money Market, there was an abundant supply and great ease at first; but aided by the Stock Exchange requirements and the close of the half year, rates became much firmer. In discount quotations, there was little change. Business in the Gas Market showed about a fair average in the early part of the week, but in the last half it tailed away to a very quiet affair. Movements in value were few and small; but the advances outnumbered the retrogressions. In Gaslight and Coke, the ordinary had a slight set-back after its smart advance. The best price was 97⅞ on Monday, and the lowest was 97 on Saturday. In the secured issues, the maximum marked 88 special and 89, the preference 107¾ and 108, and the debenture from 83½ special to 84½. South Metropolitan was steady at the old prices, marking from 118¼ to 119¾. The debenture was done at 84¾. In Commercials, the 4 per cent. changed hands at 108, the 3½ per cent. at 104, and the debenture at 82½ *cum div.* In the Suburban and Provincial group, Bournemouth "B" realized 16½ and 16⅝, Brentford new 184 and 185, British 42¼, Brighton original 207, Bromley "A" 117½ and 118, and Tottenham "B" 107. The Continental Companies were quiet and unchanged. Imperial made from 179⅛ free to 180½, Union 114½, and European part-paid from 16¾ to 17¼. Among the undertakings of the remoter world, Bombay changed hands at 6, Buenos Ayres at 11, Cape Town at 5½, Monte Video at 11⅜ and 11 7/8, Primitiva at from 6 1/16 to 6¼, ditto preference at from 4 15/16 to 5, and River Plate at 13⅛ and 13¼.

ELECTRICITY SUPPLY MEMORANDA.

The "Ipse Dixit" of Mr. Voysey—The Four to One in Favour—An Essay on Unity—Cutting Prices and Madness—A Sweeping Resolution at Hastings—Mr. Voysey's Report in Lay Hands.

A FORTNIGHT ago, in our editorial columns, there appeared a criticism of the report Mr. A. A. Voysey, Electrical Engineer to the City Corporation, has made on his illumination tests in the City, and of his deductions therefrom. At the time of writing, there has been no reply to these criticisms. Perhaps before these notes are published there will have been an attempt at answer; if so, it will serve as a text for comment on a future occasion. A few seriously congratulatory remarks have appeared in other quarters on the report. Serious remarks are sometimes amusing, especially so when cant wisdom projects from every line; and the remarks on Mr. Voysey's report that have come under observation are particularly amusing. If credulity was one of our characteristics, we should, after reading these comments, be strongly of opinion that there was no more room for controversy over the relative economy *cum* efficiency of electricity and gas for street-lighting purposes. The report, in the eyes of certain contemporaries, embraces the last word; and anything that is said, after Mr. Voysey, can, it would seem, be but mere balderdash. Human nature has its weaknesses; but the weakness of the electrician for grasping with eagerness at every straw or shadow that comes along is sufficient to soften the most stony of hearts. It must be somewhat embarrassing to Mr. Voysey to find that, at one bound, he has jumped into so much notoriety among journalists and electricians; and already he must have been meditating on the ease with which this can be done. But we always find that, after our electrical friends have got over the first flush of excitement, they cool down considerably, and look soberly to see whether the object of their admiration is all that it or he appears to be.

The next thing that will be required of Mr. Voysey will be that he should show electricians how they are to go before their committees armed with the total costs of street lighting by electricity, and prove that they confirm Mr. Voysey's assertion that "the ratio is four to one in favour of electricity." What miracles and trickery would have to be indulged in to mystify members of local authorities sufficiently to get them to believe this—unless, as at Hastings, they are the owners of an impecunious electricity undertaking, and utter beliefs framed by lips rather than mental competency. However, more of Hastings presently. Electricians will, of course, make the utmost use of Mr. Voysey's report. They are fond of stalking-horses from behind which they can strive to attain their ends. It is so useful to have someone upon whom to pour maledictions if the end is attained, but not with ultimate satisfaction to councils and ratepayers. Who could be better for this purpose than the chief electrical officer of the Corporation of the City of London! It is an opportunity not to be missed. Take the points of the report of Mr. Voysey and the criticisms made upon them in the "JOURNAL" a fortnight since; and the hollowness of much that is in the report will be readily detected. Both the report and some of our weekly contemporaries treat the City incandescent gas lighting as the *terminus ad quem* of the system; but electricians who do not build walls about them to obscure their vision know full well that science has not come to an *impasse* so far as gas lighting is concerned. It is one of the easiest things in the world to build a Fool's Paradise; it is just as easy, in fact, as getting notoriety by writing a report on illumination tests (showing the great variability between maximum and minimum illumination by flame arc lamps), or going out to India and making a few speeches *à la* Keir Hardie.

Mr. Voysey, however, has not only written a report, but he has written a letter. The letter has appeared in the "Electrician;" and it is a very curious mixture of relevancy and irrelevancy, of rationality and irrationality. In this letter, we are let into the secret that Mr. Voysey is a greater advocate of going to bed when it is dark than he is of either gas or electricity, though his report has raised doubts on the latter momentous point; that his one great desire is to promote unity among men rather than discord (his brusque manner of doing so is seen in his report); and that his philosophic spirit tells him that the terrible waste of human life and material that is taking place arises from the aforesaid want of unity among men. But we get to the point of his argument later; and it is that the time has come when there should be unity between gas and electricity vendors, who are both public servants. Mr. Voysey, truly, has done his part to prevent any such unity—at all events, in the City of London, by a report that has prejudice written all over it in capital letters. The apostle of peace, too, in his letter, says "it is quite easily ascertainable as a matter of fact, and not as an opinion, that electricity can be, under most circumstances, cheaper for lighting and gas cheaper for heating." Such dogmatic assertions are not in the interests of unity; and to show how badly Mr. Voysey has succeeded by his letter in inciting our sympathy in his peaceful mission, we will say at once that the adoption by us of the portion of the statement referring to lighting, can only take place by the conversion of the term "electricity" to "gas." And besides this, no gas man knowing the strength of his commodity in the competition, will accept the second place that the man of unity magnanimously chooses to accord to that commodity.

Our attention, however, is arrested by another sentence. It is very suggestive. We recommend it to the notice and earnest consideration of the electricity suppliers of London. "As buyers," writes Mr. Voysey, "we all know the *apparent advantages of price-cutting*. But try and trace out the whole system of trade competition; and we shall find that we gain 1d. in one pocket, and lose 2d. out of the other, and that *the whole thing is madness, which is bringing us to destruction.*" Just so. It is understood that the Electric Light Companies who have been carrying on the experimental lighting in the City, in the effort to rehabilitate reputations, are prepared to supply current for public lighting at 1d. per unit; and to bear all expenses—capital, installation, maintenance, electricity, recarbonizing, labour—on a payment of £17 10s. per flame arc lamp per annum. "The whole thing is madness," brought on by the progress and success of incandescent gas lighting—the latest of the achievements of which have not yet had trial in City streets. About the costs of the flame arc lamps in the City, more can be gained from our issue of Jan. 14 last (p. 83). But as customary in a lady's letter, the gem or kernel of the whole is found in the postscript of Mr. Voysey's letter. Here it is, and let it stand without comment: "If we were not madly trying to eat each other up, we might now be considering a scheme for the partial conversion of gas-works to join with the electric light works in endeavouring to give London the cheapest possible light, with a reasonable profit, instead of wasting our money over propositions for further waste and chaos."

The fame of Mr. Voysey's report on his (as an electrician) tests of illumination in the City has reached the Provinces—Hastings particularly; and some unkind and thoughtless individual has placed it in the hands of the Editor of the "Hastings and St. Leonard's Observer," without explaining to him matters of which he cannot be expected to be cognizant. The article in the "Observer," to the extent that it deals with this report, has obviously been inspired, for the purpose of getting public support for a resolution, passed by 17 votes to 13, by the Town Council, at the instance of the Electricity Committee (who bye-passed the Public Lighting Committee in this matter), that 480 incandescent gas-lamps—469 of which are stated to be 50-candle power lamps, and 11 containing more than one burner—on the routes of electric cables should be converted for electricity. The resolution also incorporates a standing instruction to the Committee to in future convert all gas-lamps in streets under which electric cables are laid. The Electricity Committee showed an undue anxiety and hurry to get the resolution through the Council before the accounts of the department for the past year are issued. It may be the accounts hold in store a surprise for the ratepayers, which

surprise might not allow them to look favourably upon the capital expenditure that will be entailed, of £1683 in converting these 480 lamps, and the £3 to £4 apiece that will have to be spent on all future lamps that are taken in hand, excluding the annual expense, cost of renewals, and so forth. The scanty information upon which the seventeen members voted for giving free rein to the Electricity Committee in this matter, does not suggest the exercise of that care, discretion, and independent judgment expected of them as representatives of the ratepayers in the matter of local government. The Police and Sanitary Committee of the House of Commons have lately said that the trading undertakings of municipalities should be independently treated by them precisely as though they were undertakings run by private enterprise. In the matter of the conversion of these street lamps at Hastings, has this been done? We say most emphatically that it has not.

The seventeen members have voted for a resolution to expend £1683 for the conversion of the gas-lamps, and what for? That is the heavy price to be paid for the "privilege" of spending annually with the Electricity Committee an amount equivalent to the sum the Council are paying the Gas Company for the lamps in question, without knowing whether or not they are going to get from the Committee the equivalent in illumination and reliability, and whether or not the repayment and interest on the capital expenditure and the annual payment to the Committee constitute the whole of the payments that will have to be made in respect of these lights. Is this the way to protect the interests of the ratepayers? But suppose the figures named do comprise total costs—including the renewal of 46 (not 50) candle metallic filament lamps, if the lighting hours are about 4000 per annum, at least four times a year, at 17s. or so per column per annum—the argument is that this is bringing additional business to the needy electricity undertaking. Then as it is for the sole benefit of the electricity undertaking and no one else that the change is to be made, it is only equitable that the electricity undertaking should bear all expenditure beyond what is now being paid to the Gas Company for the same service, with a guarantee that the ratepayers shall not suffer anything by the change. But it is coolly proposed that the ratepayers—the Gas Company among them—shall find the capital expenditure, and it is not yet known how much more money in addition per annum beyond the payment of £1607 to the Electricity Committee; and all that the ratepayers pay in this way is to serve the object of the Electricity Committee in trying to mask the true position of their undertaking! They mean that the ratepayers shall support the undertaking, and that liberally—if they do not support compulsorily to a larger extent through the public lighting they shall do so through the rates by making up deficits. And what assurance have the ratepayers that, if they bear these additional burdens designed to give extended business to the electricity concern, the burden of the Electricity Department upon the rates will not be as great as ever, perhaps greater. In the discussion on the matter, Mr. Hill said that electricity at present cost the department about ½d. per unit, so that they would increase their income from this addition to the public lighting by about £700 or £800. The leader writer of the "Observer," with the temerity that irresponsibility allows, avows that the Committee can supply at per lamp at the same cost as incandescent gas lighting, and "at a handsome profit." The idea has evidently been appropriated by the "Hastings Observer" writer from the ½d. per unit councillor. The last published analysis of the accounts of the Hastings Electricity Department in the "Electrical Times" tells us that the works costs alone amounted to 1·49d. per unit of electricity generated, of which 0·75d. was from "coal and other fuel;" and that including rent, rates, and taxes, management, salaries, and certain other expenses, the cost per unit averaged 2·09d., *excluding* capital charges, depreciation, and reserves. What about the ½d. per unit with these figures before us? and remember that the public lighting falls upon the undertaking just at the time of peak load. We say again that the very action that is now being taken with the intent to get the assistance of the public lighting in masking the true position of the electricity undertaking may assist in revealing the ugliness of the position in stronger light, by making it worse. And we say again, too, that the seventeen councillors who voted for the resolution have not done their duty in passing it without making a more critical examination of the whole matter. It is not purely a question of the patronizing of the municipal or the private shop; it is a question of serving the ratepayers in the most economical and efficient manner possible, and not off-setting one burden by imposing additional ones.

We had intended to devote space to a criticism of the leader in the "Observer;" but throughout it bears the impress of in part inspiration, and of a lack of knowledge. Of course, it cannot be expected that the Editor should know that the saving referred to by Mr. Voysey by certain departments of the City Corporation refers largely to bringing electricity up to date, that the changes from gas to electricity have been changes from the old wasteful flat-flame gas-burner, that the Corporation have been paying £26 per annum for each electric arc lamp, that money was saved by changing from electricity to gas in certain streets, that the shock the Electric Lighting Companies have had from gas lighting made them offer flame arcs at £17 10s. a year, charging only 1d. per unit for the electricity rather than see gas lighting proceed on its victorious course, that between £17 10s. and £26 there is a big margin for savings, and that it is hoped to see in the City before long samples of the newest high-pressure gas-lamps, consuming only 25 cubic feet per hour, and yet giving a light of 1500-candle power. These are among the matters to which the report does not give prominence. We will not, recognizing the utter insufficiency of knowledge on which the "Observer" writer penned his article (unless he treats again of Mr. Voysey's report, and so courts criticism) deal with it further. But we do say that those who presume to lead public opinion on these matters ought to make sure of their facts, and not allow themselves to be misled by the first specious support that comes to hand on the side that it is desired to champion. Meanwhile, Colchester finds that to convert 691 incandescent gas-lamps to Osram electric lamps would cost the ratepayers £2295 11s. 11d.; that the maintenance per annum of the incandescent gas-lamps amounts to £1799 9s. 7d.; while the "estimated" annual cost of the Osram lamps is £2073. The price at which the electricity was calculated is low. Even so, the figures are not good enough for Colchester. The report was prepared by the Colchester Borough Surveyor; not by the Electricity Committee. It has been found at York that the cost per 1000 candle-hours by incandescent gas-burners is 1·803d., by Osram lamps, 3·104d.—a difference in favour of gas of 1·301d. These figures were placed before Mr. H. R. Hooper at a recent Local Government Board inquiry by the Manager and Secretary of the Gas Company (Mr. John H. Hill)—the computations being made upon actual figures. Some further information regarding them can be obtained from last week's issue (p. 864).

REMOVAL OF ARSENIC FROM GAS COKE.

In the "Journal" for April 21, there was published a paper by Messrs. Henry O'Connor, F.R.S.E., and Dr. Drinkwater, F.R.S.E., of Edinburgh, on "Arsenic-Free Gas Coke," which was read before the Royal Scottish Society of Arts. The paper was remitted to a Committee, consisting of Messrs. W. R. Herring, George H. Gemmell, and Dr. Westergaard. The report of the Committee was submitted at a meeting of the Society yesterday week.

In the course of it, they state that at the outset they did not feel that they were called upon to express any opinion as to the validity of the patent, although, as far as they had been able to inquire, they could not find any previous written or printed provisions of the nature that formed the subject of the paper. For many years gas-works coke was used for malting purposes; but early in the 1900's a great scare arose in consequence of the presence of arsenic in beer, particularly in the Manchester district. It was primarily due to the presence of arsenic in the glucose used in the manufacture of the beer; but traces were found to be given off by gas-works coke, &c. This necessarily resulted in the abandonment of gas coke for the purpose throughout the country. The readers of the paper claimed that by the simple process of adding a small percentage of common salt, proportionate to the amount of arsenic in the original coal, previous to carbonization in the gas-works, the effect was to act upon the arsenic in such a way that the greater portion was vaporized, and that when the coke was used for brewery purposes, no arsenic was evolved. So far as the Committee were able to determine, the claim was justified and substantiated. The process had not long been in use; but so far as it had been, it was established that where coke so treated had been used in breweries in the Wakefield district, no complaints had arisen in consequence of volatile arsenic being given off by gas-works coke so employed. A member of the Committee suggested that the treatment of the coal by the means proposed might result in the arsenic being volatilized and going forward with the coal gas, and thus being objected to by gas manufacturers and consumers. The Committee, however, were assured by both Dr. Drinkwater and Mr. O'Connor that all the arsenic would be removed in the normal process of scrubbing the gas, and that, should the arsenic, by any possibility, be passed through that apparatus, then the purifier would remove all final traces. The commercial effect of the treatment was important, as it made it possible for brewers to use the local gas-works coke for malting purposes, which resulted in considerable economy in the cost of the fuel employed, and, on the other hand, it provided an important outlet, at reasonable profit, for the local gas-works out put of coke. The Committee believed the process to be a useful and practical one; and they had pleasure in recommending the communication to the favourable consideration of the Prize Committee. This recommendation was agreed to.

Gas Connection under Pressure.—What is claimed to be the largest gas connection made under pressure in this country has just been executed for the Tottenham and Edmonton Gas Company by Messrs. John Ruscoe and Co., Limited, of Hyde, Cheshire, to whom the contract was entrusted by Mr. A. E. Broadberry, the Engineer and Manager of the Gas Company. A 24-inch branch from the 36-inch main being required for the new governor-house, a connection was made at a point close to the holders without the slightest leakage of gas. The advantage of being able to do work of this kind without having to cut off the supply of gas or water, will be obvious to every manager; and the firm named have constituted themselves specialists in the matter. In carrying out the contract here alluded to, their latest type of machine was used,

CARBONIZATION OF ENGLISH AND OTHER COALS IN DESSAU VERTICALS AND MUNICH CHAMBERS.

The following is a summary of the comparative figures of the carbonization of English and other coals, as used by the Berlin municipal gas undertaking, in Dessau vertical retorts and the Munich carbonizing chambers, to which reference was made by Herr Ries in his paper on the latter at the Berlin meeting of the German Association of Gas and Water Engineers (*ante*, p. 848).

Coal Carbonized.	Equal Weights of Königin Louise [Upper Silesian) and Ravensworth.		Equal Weights of Königin, Louise, and Silkstone.		Equal Weights of Königin Louise and Lambton.		All Saar Coal.
Description of Carbonizer.	Vertical Retort.	Munich Chamber.	Vertical Retort.	Munich Chamber.	Vertical Retort.	Munich Chamber.	Munich Chamber.
Dates of trial 1908	April 8 to 12	April 27 to 30	April 12 to 16	May 4 to 6	April 16 to 20	May 9 to 11	May 11 to 13
Duration of carbonization . . hours	10¾ to 12	24	12	24	12	24	24
Average temp. of setting, deg. C. .	1333 to 1374	1230 to 1282	1322 to 1331	1236 to 1253	1329 to 1341	1253 to 1264	1272
,, ,, chamber, deg. C. .	..	984 to 1068	..	984 ,, 1013	..	993	1008
Gas made per ton of coal—							
Cubic feet, at 60° Fahr. and 30 in. bar	11,815	12,096	11,630	12,261	11,605	12,057	12,642
Calorific power of gas—							
Gross B.Th.U. per cubic foot at 60° Fahr. and 30 in. bar . . .	582	565	585	559	582	568	586
Net B.Th.U. per cubic foot at 60° Fahr. and 30 in. bar . . .	521	..	523	..	522	..	..
Carbonic acid in gas, vols. per cent..	1·96	0·9 to 3·2	2·24	1·0 to 4·8	2·11	1·2 to 4·0	1·0 to 2·7
Sulphur in gas, grains per 100 cubic feet	15·20	14·70	16·10	24·60	13·80	20·90	..
Specific gravity of gas	0·38	0·321 to 0·543	0·40	0·370 to 0·624	0·40	0·334 to 0·578	0·334 to 0·560
Coke produced, per cent. of weight of coal	66·38	66·21	64·88	66·89	65·50	68·35	68·67
Breeze produced, per cent. of weight of coal	4·89	3·07	4·85	3·86	4·63	3·14	3·71
Liquor produced, per cent. of weight of coal	8·47	7·98	9·10	9·11	7·71	8·98	7·15
Ammonia in liquor, per cent of weight of coal	0·293	0·28	0·322	0·265	0·281	0·286	0·228
Tar produced, per cent. of weight of coal	5·00	4·57	6·23	4·24	6·66	4·57	4·98

The vertical retort results given in the table refer to trials made without any introduction of steam to the retorts. With the first two mixtures, trials were also made with admission of steam. With the Königin Louise and Ravensworth mixture, the charge was carbonized for twelve hours without steaming; but it was then retained in the retort for another hour, during which period steam was introduced. The make of gas per ton of coal under these conditions averaged 12,638 cubic feet at 60° Fahr. and 30 inches bar. The Königin Louise and Silkstone mixture was in the retort for twelve hours all told, and steam was admitted during the last hour. The make of gas per ton of coal was 12,441 cubic feet at 60° Fahr. and 30 inches bar.

MANCHESTER DISTRICT JUNIOR ASSOCIATION.

Visit to Staveley.

After an interval of eight years, the Staveley Coal and Iron Company, Limited, having again invited the members of the Manchester and District Junior Gas Association to visit their works, a fair number of members accepted the invitation on Saturday, leaving London Road by the 8.20 a.m. train. Mr. E. J. Wellens, the President of the Association, was unable to leave his duties at Hebden Bridge; and Mr. Clarence Berry (Hyde), Mr. R. H. Garlick (Salford), and Mr. Alfred L. Holton (Droylsden), the Hon. Secretary, constituted themselves leaders of the expedition.

On arriving at Staveley, Mr. William Chambers and Mr. F. Gandy, two of the Staveley Company's Managers, headed the party and conducted the visitors over both old and new works. Nothing of importance that was to be seen was omitted from the itinerary. The huge engines, blast-furnaces, boilers, power stations, ammonia-recovery plant, coal-stores, patent pig-iron breaker, and the foundries (where the casting of iron pipes from the smallest tubes to mammoth sizes, big enough to walk through, was in progress), were all inspected. Thousands of hands are employed at these vast works, which cover hundreds of acres, intersected by railways in every direction. It is not generally known that the Staveley Coal and Iron Works have been in existence for over two centuries. The Company have their own iron mines and coal-pits; and the visitor can see the extraction of iron from the ore, its conversion into pig iron, and further processes which culminate in iron pipes for gas and water mains that are sent to all parts of the world. Steam, electric, and hydraulic power are daily in use. The completeness of the plant, the labour-saving appliances, the fixed and travelling cranes, the testing apparatus with oil and water, and the dexterity with which heavy castings are moved from the moulds to the railway waggons, after undergoing the various intervening processes, is little less than wonderful. A column might be written about the charging gear of the blast-furnaces alone, and the elaborate machinery in connection with them; but no written description can convey an adequate idea of the magnitude of this remarkable undertaking. It must be seen many times to gather a full knowledge as to its working and extent. All the pipes appear to be cast vertically, and are tested with water or oil at a pressure of 80 lbs. to the square inch. Several hours were occupied in traversing the workshops and grounds, and viewing the various processes; the final "sight" being the opening of one of the great blast-furnaces and the casting of hundreds of bars of pig iron. Four of the furnaces are at present idle; but at the old works alone the output is 80,000 tons per annum.

The liberality of the Company was well displayed during the day. After a light luncheon in the Board-room at noon, the visitors were entertained at dinner in the Institute on the grounds at 2 p.m. After the tables had been cleared, Mr. Clarence Berry moved a very hearty vote of thanks to the Company for inviting the members to visit their works that day. Especially were their thanks due to Mr. Chambers and Mr. Gandy, who had shown them so much, and been ever-ready to explain anything they wished to know. There was much more to see than the casting of drain-pipes. Those members who had not been able to attend would feel disappointed when they heard what a long and interesting tour those present had enjoyed, and how greatly the works had changed in their general character during the last eight years. No visitor that day could have failed to acquire a knowledge of something he did not know before.

Mr. J. Alsop (Stockport), in seconding the motion, remarked that in going through the works they had been struck with the various processes they had seen and the great progress which the firm had made. The visitors appreciated the kindness of the firm, and the special labours of their two guides. It would not be until after reflection that they could realize to the full what had been shown to them. Mr. Garlick said he had visited the Staveley works several times; and each visit showed him some new invention which was brought to bear upon the undertaking. Compared with even two years ago, there had been a marked increase of capacity.

Mr. Gandy, in acknowledging the vote of thanks, said eight years had elapsed since he had the pleasure of seeing the members of the Association; and it was on a similar occasion they then met in that room. The works were at that time nothing like what they were to-day. The process of making pig iron had improved. They had to move with the times. During the last eight years they had made many improvements. They could cast pipes from ⅛ inch to 3 inches thick, and of any size to suit the purchaser, whether for gas or water, and to resist any pressure up to 2000 lbs. per square inch. It had given the firm great pleasure to entertain the members of the Association.

Mr. Chambers joined his thanks to those of Mr. Gandy; and Mr. T. Blaydon, the Manager of the new works, also expressed his thanks.

The Abergavenny Town Council, on the unanimous recommendation of the Gas Committee, have decided to raise the salary of Mr. A. Kyle, the Gas Manager, from £160 to £185 per annum, to be increased at the end of twelve months to £200, with further yearly increments of £10, until a maximum salary of £250 per annum is reached. When the recommendation came before the Council, Mr. J. G. Bishop, the Chairman of the Gas Committee, said the Committee were so satisfied with the work done by Mr. Kyle that, with a view to keeping him from looking out for a better berth, they had brought forward this proposal, which they thought a very reasonable one.

A GAS-HEATED SWIMMING-BATH.

A recent number of the "Metal Worker" contained an illustrated description of a gas-heated swimming-bath which has been fitted up in the University Club at Pittsburg (Penn.). Though the fuel employed is natural gas, the installation comprises several interesting features worth noting.

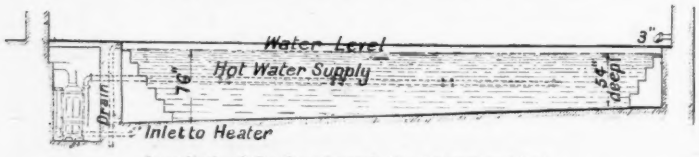
The bath is 50 feet long and 25 feet wide, has an average depth of 5 feet, and when filled contains rather more than 38,000 gallons. To have heated so large a quantity of water would have required an expensive boiler plant, whether steam or hot-water heaters had been used for the purpose; but, with gas available, the solution of the problem was very simple. When the subject of the heating of the bath was first taken up, application was made to a company in the city for information and assistance; and the result was the selection of four multi-coil circulating heaters. These were placed in a small chamber provided for the purpose at the deeper end of the bath. Owing to the fact that there was neither coal to be fed to the heaters nor ashes to be removed, the small space available was all that was required, and much less than would have been needed if coal had been used.

The location of the heaters is shown in the accompanying plan and elevation. It will be seen that they are set in pairs—one to serve each side of the bath. The flow connection from each heater is 2½ inches in diameter, and is joined to a 4½-inch main, which runs across the end and along the side of the bath, with four 2-inch connections; the main being reduced to 2½ inches after the third. The circulation of water in the bath is kept up by a 4½-inch return pipe being taken out of the bottom at the end near the heaters, and connecting into two 2½-inch branches, which in turn communicate with the heaters. Cold water is admitted to the bath by a 3-inch pipe at the end opposite the heater.

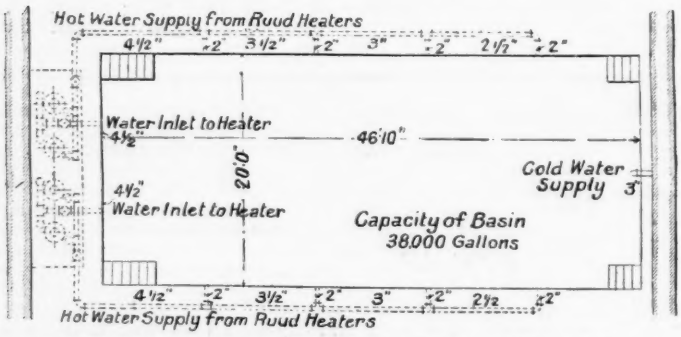
The specification required that the temperature of the water in the bath should be raised to 85° Fahr. within ten hours. A table of the official test shows that the incoming water was at 62°, and that at the end of the fifth hour the bath was filled and the water was gradually increasing in temperature. At the end of the eighth hour, the temperature at the top of the bath was 86°, and at the bottom 82°; the average rise being 2¾° per hour. The record of the test also shows that on the original heating 9500 cubic feet of natural gas were consumed. At a cost of 25 c. per 1000 cubic feet, the expense of each complete heating would be $2·40. It was estimated that 3,000 cubic feet of gas would be required to maintain a maximum temperature of 85° for 24 hours, or an expense of 75 c. It is the custom to change the water in the bath three times a week; and on this basis the monthly operating expense would be approximately $25.

In order to avoid waste of gas, the water-heaters are provided with a thermostat, which shuts off the gas supply when the temperature of the water has reached the desired point. Such an arrangement relieves those in charge of the building of the necessity for attending to the gas-fires.

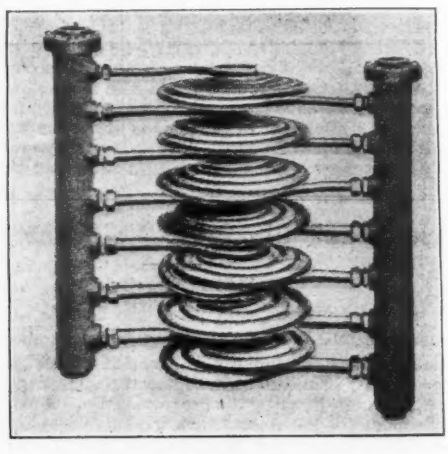
The heating of a swimming-bath by means of gas naturally arouses interest in the construction of the water-heater used; and in the photographic illustration is given a view of the coils and their connections with the flow and return heaters. The heater complete has these coils enclosed in a cast-iron jacket lined with some non-conducting material, so that the heat resulting from the special multi-bunsen burners impinges upon the coils with a minimum loss of heat to the chimney. The heaters stand 64 inches high to the top of the dome, and 58½ inches to the top of the hot-water outlet. The shell enclosing the coil is 20½ inches in diameter. Each heater is provided with an 8-inch smoke outlet; the flow and return connections are 2½ inches in diameter; and the gas-inlet to the burner is 1½ inches diameter. In the heater selected, there is one more coil than is shown in the illustration—there being eight in all. The construction provides that these coils may be readily removed should occasion require, and connections are made without the use of brazed joints—the screw joint being preferred; and being placed outside the heater, so that the action of the products of combustion cannot affect the thread, it is in every respect satisfactory.



Longitudinal Section through the Swimming Pool.



Plan of the Swimming Pool, Showing the Gas-Heaters and Water-Piping.



Arrangement of Gas-Heated Water-Coils.

Length and Size of Heating Surface in Each Heater.

No. of Coils.	Diameter of Pipe.	Length of Pipe.	Total Surface Exposed.
2	¾ inch	39 feet	9·0 sq. ft.
2	1 "	35 "	9·0 "
2	1¼ "	29 "	8·5 "
2	1½ "	29 "	9·5 "
		132 feet	36·0 sq. ft.

It will be seen from the second table that each heater exposes a surface in copper piping of 36 square feet, and the four heaters have a total surface of 144 square feet. Each square foot of surface must deal with 38,000 ÷ 144 = 264 gallons of water. As eight hours sufficed for accomplishing the work, it will be seen that the heating was done at the rate of 33 gallons per hour per square foot. Now, 33 gallons of water weigh 275 lbs. Possibly the greatest work that will ever be required of the heater will be when the winter is severely cold, when the water supplied to the heaters would be as low as 46° instead of 62°, as in the test reported. When the water was at as low a temperature as 46°, it would be necessary to raise it about 40° to reach 86°, or the 275 lbs. of water which must be warmed by each square foot of surface per hour would require a total of 275 × 40 = 11,000 heat units to be transmitted per square foot per hour.

It will be noted that the construction of the heater places the larger two coils of 1¼-inch pipe at the bottom of the heater where the temperature of the gases is the highest. Immediately above, the diameter of each of the two coils is reduced to 1⅛ inch, so as to retard the flow of water relatively, and (being in gases of somewhat lower temperature) to ensure its heating to practically the same temperature as the lower coil. The diameter of the coils is reduced to 1 inch and to ⅞ inch as the top of the heater is approached; and the temperature of the gases surrounding them is reduced. It is thus possible that the temperature of the water flowing through the top coil may be very nearly the same as that coming through the larger coil at the bottom, even though there is considerable difference in the temperature of the gases surrounding the different coils.

Society of Engineers.—By permission of Dr. R. T. Glazebrook, M.A., F.R.S., the Director, the members of the Society of Engineers paid a visit to the National Physical Laboratory, Teddington, last Saturday. They first inspected the Engineering Department and the power station, various smaller rooms for special testing machines, photomicro-graphic work, &c., and the offices. Here were shown various machines for the testing of metals under repeated stresses. They included the following: An alternating stress-testing machine, giving 1200 reversals a minute; an impact-testing machine for reversals of bending stress in a notched specimen, and one for reversals of direct stress in a plain specimen; and a new fatigue-testing machine. Among the apparatus on view may also be mentioned the following: A 1-ton testing machine with compound knife edges to produce tension or compression without moving the specimen; an abrasion-testing machine; a 100-ton and a 10-ton Buckton testing-machines; and apparatus for testing pressure-gauges, and for determining the specific heat of superheated steam.

THE ASSOCIATION OF WATER ENGINEERS.

ANNUAL GENERAL MEETING IN BIRMINGHAM.

The Annual General Meeting of the Association was commenced last Thursday morning in the Council Chamber of the Birmingham City Hall. There were a large number of members present when the Lord Mayor (Alderman Henry J. Sayer, J.P.) took the chair, in order to express and assure of the welcome of the City and the Corporation. On the daïs with his Lordship were the retiring President (Mr. Christopher Sainty, of Windsor), the incoming President (Mr. H. E. Stilgoe, M.Inst.C.E., City Engineer and Surveyor of Birmingham), the Hon. Secretary and Treasurer (Mr. W. G. Peirce), and the Secretary (Mr. Percy Griffith, M.Inst.C.E.).

The Lord Mayor's Welcome.

The LORD MAYOR asked to be allowed to offer to the members of the Association a very warm and hearty welcome to the City of Birmingham. It was, he believed, their first visit as an Association to the city; and he trusted that they would find it pleasant, enjoyable, and profitable in every way. He could congratulate the Association on the steady progress which had been made since the inception of the organization. This, he said, was the thirteenth meeting; and they had during that time more than doubled their numbers. Associations of this kind were of the greatest advantage. The members met for mutual instruction, to impart knowledge, and, of course, to raise the status of the profession; and the public obtained the benefit of it. It was, they all recognized, of the highest importance that the community should be supplied with water in an abundant quantity, and of the purest quality. In Birmingham, they were fortunate in this respect, and to that they attributed in large measure their very satisfactory rate of mortality. Indeed, Birmingham ranked as one of the healthiest cities in the kingdom. The members would later have the opportunity of visiting the Elan Valley Water-Works. The scheme was a gigantic one; and it was costing a large sum of money. But he thought they would agree with him the money had been wisely spent. In Birmingham, they placed health before wealth, and believed that, when they had acquired health, they would have gained wealth. He was glad to be able to congratulate the members upon having as their new President the worthy City Surveyor of Birmingham, Mr. Stilgoe. (Applause.) He had been Vice-President of the Association for two years; and his intimate knowledge of water—a matter of which he had made a study for many years—would make him a most valuable President. He (the Lord Mayor) could only wish that Mr. Stilgoe's experience could be repeated in Birmingham—that was to say, he had the satisfaction of seeing the income of Dover doubled from the water-rate, and contributing no less a sum than 6d. in the pound towards the rates. In Birmingham, they were not within measurable distance of that; it was the other way about. He would now leave members to their deliberations, wishing them a pleasant, happy, and instructive visit.

The PRESIDENT (Mr. C. Sainty) remarked that it was his pleasant duty to propose a vote of thanks to his Lordship for his extreme kindness in granting the Association the use of the city's fine Council Chamber for their meeting this year. The members all extremely appreciated this kindness, as well as the words with which his Lordship had welcomed them, and had referred to the work of the Association and of their incoming President. The Association had in Mr. Stilgoe a gentleman who, he (the President) was sure, would quite uphold the traditions of the Association; and, in fact, it would be a great benefit to the Association to have him as President for the year. He had much pleasure in proposing a hearty vote of thanks to his Lordship for the welcome and privileges he had accorded the Association.

Mr. C. H. PRIESTLEY (Cardiff) said he had much pleasure in seconding the votes of thanks that had been proposed. During the time the members were in Birmingham, they would have the pleasure of seeing some of the greatest water-works in the kingdom; and he was sure they were going to have a very enjoyable time.

The LORD MAYOR thanked the members for their vote of thanks. He could only assure them that it was a great pleasure to him to be there that morning; and he hoped to renew the pleasure on Friday evening.

Minutes of the Last Meeting.

The SECRETARY (Mr. Percy Griffith) then read the minutes of the winter meeting held in London on Dec. 14 last; and they were confirmed.

The New and the Retiring Presidents.

Mr. SAINTY said it was now his pleasing duty to introduce to the members their new President—Mr. Stilgoe. He was sure the interests of the Association would be well looked after by that gentleman; and under his guidance nothing could go wrong. While he (Mr. Sainty) had the opportunity, he should like to thank the members for the kind consideration extended to him last year when the meeting was held at Windsor. He was then in a weak state of health, and was not able to do his duty as he ought to have done. He was sure they would all enjoy their visit to the noble city of Birmingham, of which their President and all people resident there must be very proud.

Mr. STILGOE took the chair amid much applause.

The PRESIDENT said his first duty in the presidency was to propose a vote of thanks to the late President. He was sure the members would agree with him that the business and conduct of the affairs of the Association had been everything they could desire during Mr. Sainty's term of office. The year had been a most successful one, the membership had increased, and the financial position had improved. They had had during the year some excellent papers presented. He was quite sure they would agree with him that generally there had been a considerable improvement all round in the work of the Association. He had therefore much pleasure in proposing a hearty vote of thanks tc their late President.

Mr. H. ASHTON HILL (South Staffordshire Water-Works Company) said very few words were required from him in seconding the resolution. The position of the Association, as the President had said, had during the past year gone on steadily improving; and a good deal of this was no doubt due to the urbane manner possessed by their late President.

The motion was carried by acclamation.

Mr. SAINTY, in reply, said he thanked the members for the kind expressions that had been made as to his year of office. What he had done for the Association had been a labour of love. He was proud of the organization; and he should in the future be just as pleased as he had been in the past to do all that was possible to ensure its continued prosperity.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—Being deeply sensible of the honour which you have conferred upon me by electing me as President of this Association for the ensuing year, it is my first duty to express to you my thanks, not only for the honour conferred, but for the personal kindness thus shown to me. The circumstances of my occupancy of the chair are somewhat remarkable, inasmuch as I am not at the moment practising as a water engineer, nor do I hold an official position as one. Two years ago, when I resigned my appointment of Borough and Water Engineer of Dover to commence my new duties as City Engineer and Surveyor of Birmingham, I was the junior of your two Vice-Presidents; and I was considerably perplexed as to whether I ought to remain in office beyond the end of the year. Having submitted the matter to my colleagues on the Council, and left myself unreservedly in their hands, they nominated me Senior Vice-President for the year 1907-8, and subsequently as President for the ensuing year, both of which nominations you have been good enough to confirm by your votes at the elections. Having unburdened myself on this personal matter, allow me to assure you that during my year of office I will, with the co-operation of my colleagues, endeavour to maintain the good government of the Association, preserve its honour and dignity, and extend its usefulness for the benefit of its members and those we have the honour to serve.

REPORT ON THE YEAR'S WORKING.

I will now follow the precedent set by my predecessors in office by briefly reviewing the work of the Association

during the past year. This practice is perhaps more convenient than the alternative of presenting you with an annual report from the Council as a body, as it enables each succeeding President to grasp the salient features of the work done during a period when, although not yet oppressed by the responsibilities of the presidency, he has of necessity borne a very large share of the administration of the Association's affairs. Speaking generally, the past year has in several respects been a notable one in the history of the Association; not that any very dramatic changes have been effected in our procedure or numbers, but rather because of the steady and effective progress which has been made in practically every department of our organization.

Membership.—The following table shows our development in regard to numbers during the last three years:—

Membership Roll, Jan. 1.	1906.	1907.	1908.
Honorary members	2	2	2
Members	206	208	206
Associate members (previously associates, Class A)	86	90	108
Associates (previously associates, Class B)	33	32	36
Totals	327	332	352

The increase in the ranks of the associate members must be considered satisfactory, as it indicates that the junior members recognize the advantage of belonging to the Association, the first object of which is to promote and facilitate the interchange of information, ideas, and practice on all matters pertaining to water undertakings. Under this head I may take the opportunity of stating that the Council have recently remodelled the forms of proposal and transfer, with a view of obtaining more definite particulars of the education, engineering training, and official position of candidates. It will be conceded that the enhancement of the value of our membership certificates can only be attained by carefully restricting them to those who are fully qualified to belong to the Association.

Transactions.—The volume of "Transactions" issued in April last will provide a full record of the work done during the past year; and I cannot refrain from congratulating Mr. Sainty on a record volume and on a remarkably successful year. A new feature of the "Transactions" is the inclusion of abstracts of decisions in the leading legal cases affecting water supply which were heard during the year. The meeting at Windsor was well attended and much enjoyed by all present. The inspection of the Staines reservoirs, under the personal guidance of Mr. R. E. Middleton and Mr. Walter Hunter, was of particular interest and value; and the attendance of these eminent gentlemen afforded much gratification. The London meeting in December, for which the Geological Society once more lent the Association their commodious apartments in Burlington House, proved a great attraction and secured a larger attendance than at any previous meeting. The papers presented at both these meetings were of unusual excellence, and, with the discussions, have made Volume XII. of the "Transactions" a record in regard to size as well as usefulness. Special thanks are due to Mr. Easton Devonshire for his contributions, giving the history and detailed descriptions of the various water undertakings of Paris and its suburbs.

Visit to Paris.—This trip, in spite of its unique and instructive value, was not as well patronized as the Council had hoped it would be. The papers above referred to will, however, have enabled those members who were unable to take part in the visit to study the various features of interest at their leisure, and no doubt another visit may be arranged in the future, which it is hoped will attract a larger attendance. While the Parisians have in many respects brought their water undertakings well up to date, they have not yet followed the example of London in consolidating the various works under uniform municipal management, and as regards pumping machinery, their water-works are not altogether equal to the best examples to be found in this country. In this connection, I desire to make special reference to the hospitality and untiring courtesy of the Engineers and Directors under whose auspices the several works were inspected. While the Council regretted their inability to adequately acknowledge the kindness shown to the members on that occasion, they have arranged to present copies of our "Transactions" annually to five gentlemen representing the Municipality of Paris and the two large Companies who jointly afforded us such a hearty welcome.

Finance.—In every respect the financial situation is a satisfactory one, and the Association is every year becoming more firmly established in this important aspect of its well-being. As our annual income provides increasing surpluses it will be within the power of the Association to still further extend its sphere of usefulness by providing the means of gaining wider knowledge or by offering premiums for papers of exceptional merit.

Regulations.—The Council are pleased to report that the prolonged and arduous labours of the "Joint Committee on Water Regulations," constituted in 1903, upon which the Association has been so fully represented, have at last borne fruit, and standard specifications for the fittings in most common use, as well as a "Model Code of Regulations," are now published and available for the use of water authorities and engineers in charge thereof. It is satisfactory to be able to record the fact that the Local Government Board have accepted many of the recommendations of the Joint Committee, and will incorporate these modifications in their Model Byelaws. I would, however, direct attention to the fact that it is desirable to regulate not only the weights of lead service pipes, but also their composition, as it is within the experience of many of us that some lead pipes of the heaviest sections become corroded shortly after being laid in the ground, and serious waste and damage by leakage occur thereby.

Deputation to the President of the Local Government Board.—There are many matters which, in the opinion of the Council, require the attention of Parliament, and warrant special inquiry and the collection of expert evidence. Among these may be mentioned, the inconsistent, scattered, and out-of-date provisions of the general water-works law, the necessity for the collection and codification, under governmental authority, of information bearing upon the water supply of the country, and the much-debated question of the control of the various sources of water by specially constituted Boards. It has also been felt that the proposal to introduce legislation based upon the third report of the Royal Commission on the "Pollution of Rivers and the Disposal of Sewage" would be inopportune until the question of water supply has been similarly inquired into. It is therefore proposed to ask the President of the Local Government Board to receive a deputation from our Association and other kindred bodies, so that the facts of the case may be laid before him, together with a request for the appointment of a Royal Commission or other official Committee of Inquiry.

Generally.—In concluding this survey of our work, let me mention the election of Dr. Hugh Robert Mill, D.Sc., LL.D., F.R.S.E., as an honorary member, and the arrangements made to exchange "Transactions" with the Royal Meteorological Society, of which he is the distinguished President. The collection of rainfall statistics in our library cannot but be of the utmost value to our members; while those interested in the science of meteorology are also certain to find the records of our work as water engineers both interesting and useful. Dr. Mill's work in continuing the compilation of the "Records for British Rainfall," so long carried on by our late honorary member, Mr. G. J. Symons, F.R.S., is well known and highly valued; and it is appropriate that one so prominently associated with meteorological work as Dr. Mill should also be an honorary member of this Association.

Early Examples of Water-Works.

Having reviewed the past year's proceedings of the Association, let me say a few words upon the particular element with which we have to deal. Water, being a necessity of life, it is not surprising that there should be records and even instances of the existence in very early times of works for its collection and distribution. We read of the works of irrigation and water carriage in operation in Egypt between 2000 and 3000 years B.C., and of similar works in other countries from that time onwards. Anyone who will study the various descriptions and examine the illustrations of the aqueducts of ancient Rome cannot but be struck by the boldness of design and the magnitude of the work. Of the eleven principal aqueducts, the first was constructed in the year 312 B.C., by the censor Appius Claudius Crassus. It was over 10 miles in length, 2 ft. 7½ in. wide and 5 ft. 3 in. in height, constructed in masonry, and for the most part underground. The last of them was built in the Third Century. Some of them conveyed spring water, others river water; the spring water aqueduct, Marcia, having a length of 58 miles, a width of 3 ft. 6 in. and a height of 5 ft. 8½ in., and the river water aqueducts, Anio Vetus and Anio Novus, must have been works of great magnitude.

The limits of a short address will not permit me to trace the history of water-works engineering, including the collection, storage, purification, distribution, &c., of water; nor have we much concern at the moment with these grand works of Ancient Rome, or the beautiful specimens of her handicraft in connection with water vessels, taps, &c., some of which so nearly resemble those in use but a few years back, except as an exemplification of the strength of character, determination, diligence, and wealth of the Romans, and as proving that in so magnificent a city, the water supply was one of the chief cares of succeeding Emperors and their officers.

Allocation and Protection of Sources.

The necessity of adequate supplies of wholesome water for our towns being so generally admitted, the amount of waste or abuse of water that takes place is extraordinary; and it behoves us to consider how our sources of supply may be best protected from pollution and used to the best advantage. We know that the rainfall of this country is by no means equally distributed; the greatest rainfall being in the north, north-west, and west, and the least in the south-east and eastern parts. Moreover, that in seeking a source of supply, the geological formation is an all-important factor; consequently, a watershed must be considered not only in respect of area, but also of rainfall and formation. It is only natural that towns which are outgrowing their home water supply should look farther afield, and, so far as Parliament will permit, seek unpopulated areas from which an abundant and pure supply may be obtained. Birmingham and Liverpool naturally looked to Wales, and Manchester to the Lake District. Leicester, Derby, Nottingham, and Sheffield will derive a supply from the Derwent Valley works now in course of construction. The following are some of the main features of the sources of these new supplies:—

	Birmingham: Elan Valley.	Liverpool: Lake Vyrnwy.	Manchester: Thirlmere.	Leicester, Derby, Nottingham and Sheffield: Derwent Valley.
Area of gathering ground (in acres)	45,560	23,500	11,000	31,964
Average rainfall per annum (in inches)	69	65	85	47
Compensation water (gallons per day)	27 millions.	10 millions.	5½ millions.	15¼ millions.
Storage capacity of reservoirs (in gallons)	18,000 million.	12,000 million.	8,130 million.	10,000 million.
Length of aqueduct (in miles)	73¼	68¼	95⅞	Leicester . . 60 Derby (branch) 1 Nottingham do. 8 Sheffield do. . 4

London is undecided whether to seek a new or augmented supply from Wales and at some future date to abandon, wholly or in part, its supply from the Thames and the Lea. The Royal Commissions of 1893 and 1899 on Metropolitan Water Supply, although hearing an enormous mass of evidence, have not converted the minds of those engineers who believe in the efficacy of the present sources of supply, nor of those who advocate a supply from Wales. Figures have been put forward to show that there can be obtained from the Thames and the Lea, from wells in the valleys of both of these rivers, and from wells in the Kent Water Company's district and beyond that district, more than sufficient to meet the requirements of Water London and the population of the rural districts which would have to be supplied from these sources in the year 1961. The population to be provided for is calculated at 22 millions; and the rate per head per day for all purposes is taken at 35 gallons—this being the provision per head laid down by Lord Balfour of Burleigh's Commission of 1899. However this may be, the whole question appears to hinge on the adequacy of the protection from pollution of the sources of supply. The Thames Conservancy Board exercises a strict watch upon the waters of the Thames and its tributaries; but the increasing population on its higher reaches, and the extended use of the river as a pleasure resort, tend to increase the difficulties. But as difficulties arise, so no doubt will they be met by the provision of suitable storage and filtration, although it may even then be necessary to augment the supply from an outside source.

Other large towns besides those mentioned are moving in the same direction; and it would appear desirable that the proposed River Boards should undertake the duty of considering the necessities of various towns with a view to *provisionally* allotting unappropriated sources of supply, subject, of course, to a time-limit for claiming the allotment and to the sanction of Parliament. To this end a map should be prepared showing the authorized area of supply, the area of the respective natural watersheds, the locality of the wells, and other sources of supply outside such watersheds, in respect of every water authority in the country; and, in connection therewith, there should be collected statistics of the rainfall, flow of streams and rivers, discharge of springs, yield of large wells, &c. The collection of statistics would not, if systematically carried out, be the formidable undertaking that it appears to be, as so much of the information is already in the hands of members of this Association, who would, I am sure, willingly assist in the work. It is fortunate that such of our great towns as have outgrown their local water supplies, are within comparatively easy reach of outside supplies, while the more arid districts (if I may so refer to them) are not so thickly populated. Essex, for instance, referred to in connection with the London water supply, has great difficulty in supplying its own inhabitants, and certainly has no water to spare for other people, except in the valley of the River Lea.

In considering the chalk area, particularly in regard to obtaining large supplies of water therefrom, it will be borne in mind that the chalk, although receiving water freely, parts with it very reluctantly, and it is difficult to abstract from it anything like the quantity it absorbs. Those who have had experience of sinking wells and driving adits in the chalk will testify to the peculiarities of the flow of its underground water. In this connection, perhaps I may be permitted to speak of the chalk area around Dover. The dip of the strata is to the north-east, and the cliffs, when viewed from the seashore, reveal the Lower, Middle, and Upper Chalk; to the westward, between Folkestone and Dover, the base of the Lower Chalk is above the level of Ordnance Datum; near Shakespeare Cliff it disappears below this level; the Middle Chalk in turn disappears opposite Dover Castle; and to the eastward, towards St. Margaret's Bay, the section shows the Upper Chalk alone to be visible.

The Dover watershed has a catchment area of about 17,900 acres. Over the greater portion of the area the upper chalk caps the hills; its junction with the middle chalk is seen in the slopes to the valleys. Clay soil overlies the chalk on the high ground, but the sides of the hills are very barely covered. The surface is deeply indented by valleys, of which there are six principal ones. These valleys converge to that of the Dour, the name of the small and only river, and which discharges into the sea at Dover Harbour. The River Dour is 3¼ miles in length; its normal visible flow being about 3¾ million gallons per day. Its visible sources are at Bushey Rough and Watersend. After periods of heavy rainfall an intermittent spring or nailbourne, known as the Drellingore, rises and flows over the surface of the ground, following the line of the Alkham Valley from Lower Standen to Bushey Rough, a distance of about 3½ miles. In the year 1888, when this nailbourne was particularly strong, its flow was gauged at 407,376 gallons per day.

I have kept rainfall records of this district since the year 1896, and have recorded monthly since 1898 the levels of many wells in the Alkham Valley. From these observations, and from my pumping records and gaugings of springs, &c., I have been able to account for a large proportion of the rainfall, to note the effect of the rainfall upon the levels of wells, and of pumping upon the levels of the underground water; also to ascertain the direction of the flow of the underground water. After deducting the area from which the water flows either out of the watershed or towards the sea, we get an area of 14,930 acres, on which there is an average rainfall (at 30 inches per annum) of 27,840,360 gallons per day. Of this quantity, there is pumped from wells at:—

	Gallons per Day.
Dover Water-Works (Castle Hill)	1,700,000
Dover Castle	36,000
Dover Western Heights	168,000
Dover Priory Station	167,000
Buckland Paper Mills	1,627,200
Lower Standen (Folkestone Water-Works)	1,000,000
	4,698,200

It is found that the levels of the wells on the high ground

at the heads of the valleys are affected very little by the rainfall; whereas those lower down in the valleys show considerable fluctuations. There are great quantities of water from the chalk, flowing out to sea between high and low water mark; and it has been suggested that tunnels, parallel with the coast, might be driven to intercept it. The two main objections to this course are the expense, and the danger of overpumping; thus running the risk of admitting salt water into the tunnels. I have gauged several of these springs, and consider that, as a rule, their value, from the point of view of yielding a supply worth conveying to a considerable distance, is often over-estimated. The water-bearing qualities of the chalk are so well-known that it is only necessary here to state that the Upper Chalk is of a friable nature, absorbs the rainfall very rapidly, and, like the Middle Chalk, parts with it very slowly. The Middle Chalk is closer in texture, and has more defined channels in it. The Lower or Grey Chalk is hard, practically impervious, and has fissures in it even larger than those in the Middle Chalk, but not so numerous. Anyone wading knee-deep through the water running in a long adit in the Middle Chalk cannot fail to be impressed by the sight of the pure water pouring out of the fissures into the channel which has been cut to intercept them; and it is then easy to understand how one may sink wells and drive adits, and still miss the water for want of knowledge as to the direction of its flow.

Waste.

When the average supply in any large town exceeds 25 gallons per head per day, it may be assumed that waste in some form or other is taking place. This may be attributable to the water authority or to the consumer; and the causes should be detected and remedied without delay. Leaks in mains and service pipes not only become larger, but cause damage to roads and buildings. A great quantity of water is often used in ignorance by householders, who leave their taps running to, as they imagine, flush the drains. This is absolute waste, as it is well known that drains and sewers are best flushed by means of the intermittent discharge of volumes of water from properly-constructed flushing tanks. Apart from culpable neglect, there is the waste due to the use of sanitary appliances which require an inordinate quantity of water to flush them, or which are not properly cleansed by one discharge of the flush cistern.

From time to time I reported on the water supply of Dover, with the view of reducing waste; and by a thorough system of inspection and metering, and the alteration of defective fittings, I was enabled to greatly reduce the quantity of water pumped for ordinary domestic consumption—in fact, by a great increase in the trade supplies, and practically no additional expenditure in labour, fuel, &c., for pumping, the net income was doubled. I found that the discharges of water through various orifices at our average pressure were as follows:—

Small pinhole	60 gallons in 24 hours
Large ,, ...	100 ,, ,, ,, ,,
¼-inch diameter hole	1440 ,, ,, ,, ,,
½-inch ,, ,, ...	3600 ,, ,, ,, ,,
½-inch ,, ,, ...	9600 ,, ,, ,, ,,

It was not until the year 1808 that cast-iron pipes began to supersede timber trees, generally elm, for the purpose of conveying water, and even at that date there does not appear to have been much done to check waste. There was a common idea that the intermittent system of supply was the more economical; and to the late Mr. Thomas Hawkesley, Past-President of the Institution of Civil Engineers, must be given the credit of so persistently urging the fallacy of this and of advocating the system of constant supply as not only being the more convenient, but that which occasioned the least waste.

In conclusion, I trust I have not overburdened my address in the matter of the preservation of our water supply, but I feel so strongly on the subject that I have been tempted to deal at some length with the question of its proper care, to the exclusion of many points that come within the scope of the profession of a water engineer. I should have liked to speak on many other such matters, but time does not permit.

At the close of the address,

Mr. William Matthews (London) remarked that he had a pleasing duty to perform, in asking the members to pass a vote of thanks to their old and esteemed friend for his very interesting address. The members were not at liberty to discuss the address for very good reasons; but they could express their opinion on the address, which had afforded them a great deal of information, and had given them much to think about. They could not but recognize that Mr. Stilgoe had devoted a great deal of time to the preparation of the address. But he (Mr. Matthews) had no doubt it had occasioned him much pleasure, because, removed from his old sphere of activity, he had for the purposes of this address, to return to his old love. He (Mr. Matthews) could not sit down without complimenting Mr. Stilgoe upon the position in which he found himself as President, and cordially congratulating him, as did at the same time the members of the Association at seeing one of their number—going perhaps a little out of their special course—occupying such an eminent position as Mr. Stilgoe did that day as the Engineer and Surveyor of, in many respects, the premier municipality of the country. He said, "in many respects," because Birmingham was always looked upon as having taken among municipalities the leading place in progress.

Mr. Easton Devonshire (London) seconded the vote of thanks to the President for his admirable address. He observed that the information it contained was very considerable; and it outlined in many ways some of the work that had been before the Association. The preservation of water and of the sources of water supply summed up a great deal of what the address aimed at; and that preservation they must get in future. He believed that, under the presidency of Mr. Stilgoe, they would make a strong and useful start in that direction; and they could all contribute by their knowledge and work to attain that end to the benefit of the country generally. He also desired to congratulate Mr. Stilgoe on the position he occupied in Birmingham.

The motion was warmly endorsed by the members.

The President, in responding, said he thanked the members most heartily for the kind reception they had given to his address; and he thanked Mr. Matthews and Mr. Devonshire for the generous words in which they had proposed and seconded the vote of thanks. He could sincerely say that he did feel it a great honour to occupy the position of President of the Association. In preparing his address, although, as Mr. Matthews said, it gave him considerable pleasure, it also gave him considerable labour. He had tried to confine himself largely to one or two points in which the Association might try to do some good work during the year. He also thanked Mr. Matthews and Mr. Devonshire for so kindly referring to him in his present official capacity as the City Engineer and Surveyor of Birmingham. He had expressed these views before, and he thought that there was no harm in expressing them again: These appointments continued; but individually they merely had charge of them for a few years, and, therefore, while they held them, it behoved them to add such lustre to them as they could.

Hon. Auditors and Scrutineers.

The President nominated as Hon. Auditors, Mr. R. E. Middleton (Westminster) and Mr. W. Vaux Graham (Westminster); and as Scrutineers, Mr. H. G. Coventry (Rothbury Works, Tynemouth Corporation) and Mr. C. H. Roberts (South Staffordshire Water Company).

The nominations were approved.

Valuable Assistance.

The Secretary, in making certain announcements regarding the proceedings, referred to the visit that members were going to make on Saturday to the great Elan Valley works of the Birmingham Corporation, and mentioned that Mr. Antony Lees, the Secretary of the Birmingham Corporation Water Department, had kindly deputed one of his Assistants (Mr. E. C. Ryland) to act as his (Mr. Griffith's) deputy on that occasion, as it would be impossible for him to join in the excursion as well as in the one to the South Staffordshire Water Company's Ashwood, Hinksford, and Spring Mire stations.

Papers and Discussions.

The papers and discussions were taken in the following order:—

Thursday—

"Wells and Boreholes for Town Water Supplies." By H. Ashton Hill, M.Inst.C.E, Engineer of the South Staffordshire Water Company.

Friday—

"History and Description of the Cape Town Water-Works." By R. H. Wynne-Roberts, M.Inst.C.E.

"The Design and Construction of Impounding Reservoirs." By William Watts, M.Inst.C.E., F.G.S.

The papers and discussions will be dealt with in future issues of the "Journal."

During the proceedings on Friday morning,

The PRESIDENT announced that the Scrutineers reported that the whole of the candidates for membership in the various classes had been elected, as follows:—

Members.—Mr. H. C. Head, of Winchester; Mr. J. E. Swindlehurst, of Coventry; Mr. A. H. Walker, of Loughborough; and Mr. M. G. Weekes, of Westminster.

Associate-Members.—Mr. T. L. Horne, of Antofagasta; Mr. A. W. Lloyd, of Watford; Mr. G. H. Raddin, of Lincoln; Mr. W. H. Shipp, of Cawnpore; Mr. P. J. Slee, of Bristol; and Mr. W. Wells, of Autofagasta.

Associates.—Mr. R. A. Blakeborough, of Brighouse; Mr. A. B. Simpson, of London; and Mr. A. Towler, of Ilkley, Yorks.

Votes of Thanks.

The PRESIDENT said they had now come to the end of their technical proceedings; and it was his duty to propose a hearty vote of thanks to the Lord Mayor and the City Council for their reception of the Association, and for the use of the Council Chamber for the meetings; also to the Water Committee for their permission to the members to visit the Elan Valley and Frankley water-works. No words from him were needed to commend the resolution.

Mr. W. H. HUMPHREYS (York) seconded the motion. He said he was sure the members all felt deeply grateful to the Lord Mayor and the Corporation for having so kindly placed the Council Chamber at their disposal, and treating them with such great hospitality.

The motion was carried with applause.

Mr. H. ASHTON HILL proposed a vote of thanks to the Directors of the South Staffordshire Water-Works Company and to Messrs. Stewarts and Lloyds, Limited, for permission accorded the members to visit their respective works.

Mr. A. B. E. BLACKBURN (Sunderland) seconded the motion, which was carried unanimously.

Mr. C. CLEMESHA SMITH (Wakefield) moved a vote of thanks to the readers of the papers. He remarked that the members were under a deep debt of gratitude to the authors of the valuable papers that had been laid before them. The contributions contained information of the greatest value and interest; and this was evinced by the considerable length to which they had been discussed.

Mr. J. J. LACKLAND (St. Helens) seconded the motion, which was cordially agreed to.

Mr. E. A. B. WOODWARD (Wolverhampton) proposed a vote of thanks to the President for the excellent arrangements he had made for the entertainment and interest of the members. Birmingham, he said, had always had a good name for progress, and for doing everything possible for improving the conditions of the residents generally of the city. The members would agree with him that the President had followed the lead laid down, and had justified Birmingham. They had had ample evidence of the careful forethought the President had spent on their reception; and of the efforts he made to give them an interesting time.

Mr. J. W. M. RICHARDSON (Birkenhead) seconded the motion, which was agreed to by acclamation.

The PRESIDENT (who was received with cheers) said that, if any efforts of his in making the arrangements for the meeting had contributed to the instruction and entertainment of the members, he was amply repaid. It had been a great pleasure to him to do what he could for their comfort and pleasure; and he felt it a high honour that he had been enabled to do this. He trusted that, during his year of office, not only the members of the Council, but the individual members of the Association, would assist him to carry out, to complete satisfaction, the somewhat arduous duties of his office. He should do his best; and he believed that the members would support him ungrudgingly.

Mr. S. R. LOWCOCK (Westminster) moved a vote of thanks to the Council and officers. He observed that it was quite unnecessary for him to remind the members how extremely well the Council looked after the interests of the members of the Association. He fancied there had been a little slip in not thanking the gentlemen who, metaphorically speaking, cut the members up into sections on their visit to Frankley the previous day, and conducted them round the works.

The PRESIDENT said he had not overlooked the point, but had proposed to defer thanking Mr. Antony Lees, Mr. Macaulay, and the other gentlemen on their visit to Elan Valley the following day.

Mr. R. B. RIGBY (Bury and District Joint Water Board) seconded the motion, which was unanimously carried.

Mr. C. SAINTY (Windsor) wished to propose a hearty vote of thanks to their worthy Secretary (Mr. Percy Griffith) for the unceasing energy that he showed in the interests of the Association, and particularly for the use he had been to him (Mr. Sainty) during his year of office.

The PRESIDENT desired to second this motion from the Chair. Mr. Griffith's qualities—his courteous manner, and the great attention he paid to every desire of every individual member of the Association—were, he said, so well known that it required no words from him to add to the reputation of their Secretary.

The motion was passed by cheers.

Mr. GRIFFITH, in responding, said it was a great pleasure to him to find his work was appreciated; but his fear was that they should appreciate it more than it was worth. Much of the work at both the Windsor and the present meeting had devolved upon the Presidents; and they had really done more than their share to make the meetings successful. Personally, he found that he suffered one disability—that was, the absorption of time and attention at the meetings to the little details of the office prevented him taking part in the discussions, and imparting any information he might possess regarding matters under debate.

This concluded the business sittings.

SOCIAL EVENTS.

Annual Dinner.

The Annual Dinner was held on Thursday evening at the Grand Hotel. The President was in the chair; and accompanying him at the head table were prominent members of the Corporation and officials. The Lord Mayor unfortunately could not attend. Among those present, however, were Aldermen Sir James Smith, C. G. Beale, Clayton, Dexter, and J. Hunt. Mr. Antony Lees, the Secretary of the Corporation Water Department, and Mr. John Watson, the Engineer to the Drainage Board, were among the City's officials who were present. After dinner, several toasts were proposed and honoured; the speeches being interspersed by some excellent glees and songs by members of the Moseley Quartette.

After the loyal toasts,

Mr. C. SAINTY (Windsor) proposed "The Corporation of the City of Birmingham." He remarked that since he had been in the city he had had opportunities of admiring its work. As a manufacturing centre, Birmingham was renowned the world over; and the municipal work was found by many worthy of emulation. The Council Chamber in which the meetings of the Association were being held was one of the finest he had ever seen.

Alderman Sir JAMES SMITH responded. In the course of his observations, he said the services of the Engineer had been called in in almost every fresh development that the city had made. The skill of the Water Engineer was called in when the local supply of water threatened to fail to meet their requirements; and the result was the great Welsh scheme. He jocularly spoke of the light-hearted way in which the engineering profession exceeded their parliamentary estimates, and said he could understand the charm and fascination of carrying out a large scheme, however difficult it might be, when the engineer had a powerful corporation behind him. However, he did not think that the consumers sufficiently appreciated the reasonable charges that were made for water; but it only required a good frost to cut off their supply to make them appreciate what they lost.

Alderman C. G. BEALE, Chairman of the Corporation Water Committee and of the South Staffordshire Water Company, proposed "The Association of Water Engineers." Amid cheers he announced his intention of accompanying the party on Saturday to view the recently finished great work of the city in the Elan Valley. He acknowledged the indebtedness of Birmingham to Liverpool and Manchester in having led the way with their great gravitation water schemes; and he then traced the trials and troubles preceding the entry upon the magnificent Elan Valley undertaking, following with a general history of the works. One thing in connection with them was that the people of Birmingham were beginning to realize that the preparation of parliamentary estimates was not an exact science. If they had known what the cost of the scheme would have been, if they had thought it would have cost twice as much as was originally estimated, they might perhaps have been frightened. But if they had been, he did not know what their condition would have been like now in respect of water supply. Looking at the growth of the population of the country, he thought that co-operative measures would be very necessary in relation to water supply in the future. He spoke in high complimentary terms of the President, whose position of City Engineer had made them in Birmingham almost forget that he at one time held the office of Water Engineer in another sphere of labour.

The PRESIDENT made suitable acknowledgment of the kind words and actions of their guests of the City Council. He also spoke of the practical objects of the Association, and then referred again, on similar lines to those followed in his address, to the question of the formation of a Water Board, and the assistance that should be rendered by water undertakings to such a body. Alluding to the good work already done by the Joint Committee on Water Supply Regulations, with the view to agreeing upon regulations as to service fittings, &c., he said the Association were now beginning to take their proper position on this Joint Committee. The engineers who had charge of the water under-

takings of the country were surely the ones who should recommend, and who should say, what the regulations should be. It also behoved water engineers to see that the supplies they provided were used to the best advantage—without waste and without abuse. The fair use of everything was good; the abuse of it was bad. In his concluding remarks, he expressed the opinion that the winter meeting of the Association should be spread over two days, as it was impossible at the one sitting to deal in a proper manner with all the papers presented.

Mr. R. Askwith proposed "Kindred Institutions," and response was made by Professor S. M. Dixon, M.Inst.C.E., of the Birmingham University.

Mr. Easton Devonshire proposed "The Visitors," and Mr. John Watson, Engineer to the Drainage Board, replied. One singular point was brought out in his remarks. He said that, when the members were at the Frankley works that afternoon, they would have noticed that the water was dark in colour. This was due to the peat in the water. When the water in the form of sewage arrived at the Drainage Board's works, it was subjected to bacteriological treatment; and he had noticed, on more than one occasion, when taking the water and gauging it through a capacity tube, that it was clearer, after treatment, than was the water that was sent into Birmingham. He did not suggest it was so pure; but a certain amount of the peaty matter had been eliminated in the purification process. He did not pretend to explain this. But, of course, the best remedy for clearing water of peat was to subject it to sunlight. One of the processes the sewage had to undergo was that of oxidation, and the water was distributed over bacteria beds by being sprayed, as nearly as they could get it, in the form of rain drops. The water lay on the surface, and was subjected to sunlight. It was no doubt in consequence of this that they did perceive in the effluent a clearer water than the water that was originally sent into the city.

The Lord Mayor's Reception.

On Friday evening, there was a reception by the Lord Mayor and Lady Mayoress at the Council House. The handsome reception rooms were gay with their choice floral decorations; and a happy evening was spent by the guests of his Lordship and Lady. Besides the members of the Association, and their ladies, aldermen, councillors, and city officials, with ladies, were present; the number of guests being about 150. Music was rendered during the evening by Gilmer's Band. The charming courtesy of hosts, and the equally charming entertainment provided by them, made the time pass delightfully and all too quickly.

VISITS TO WORKS.

On Thursday afternoon, a large party of the members and their ladies, visited, by brakes, the Frankley water-works of the Birmingham Corporation. They were accompanied by the President and Mrs. Stilgoe, who kindly entertained them to tea at the station. The visit occupied about four hours. The works need not be described here, as they form part of the descriptive account of the Elan Valley scheme of the Birmingham Corporation that Mr. E. Antony Lees, the Secretary of the Water Department, prepared for the use of the members, and of which account we reproduce considerable portions (see pp. 934-8).

On Friday afternoon, the Coombes Wood Tube Works of Messrs. Stewarts and Lloyds, Limited, were visited. The members were received with the courtesy the firm always extend to their visitors. The operations of the firm are world-famed; and the members were considerably interested in seeing with their eyes something of what they had heard of with their ears.

The special visit of the week was the one on Saturday to the Elan Valley Water-Works of the Birmingham Corporation; but it was a whole day's excursion, and involved leaving Birmingham at 8.20 in the morning, and not reaching it again until 9.30 at night—a period of over thirteen hours. Rhayader was the destination of the special train from Snow Hill; and at the Lion Royal Hotel, Rhayader, luncheon was served. From there, to view the works, the journey had to be made by brakes. A meat tea was provided at the hotel before the return journey was undertaken. Again Mr. Antony Lees' description must be consulted for an account of the works that the members went such a distance to view. It need only be said here, to enlist the interest of readers in it, that no less an expenditure than £5,762,853 had been incurred up to March 31 last in connection with this majestic scheme.

For those members who could not spare the time for the long journey to Rhayader on Saturday, Mr. H. Ashton Hill, the Chief Engineer of the South Staffordshire Water Company, arranged a short, comfortable trip, which only involved an absence from Birmingham of about four hours. As in the case of the Elan Valley visit, the start was made from Snow Hill Station. Stourbridge Junction was the railway destination; and from there brakes were in readiness to convey the parties to the various pumping-stations included in the day's itinerary. First the Ashwood works were visited, then Hinksford, and finally Springs Mire. From here the visitors were driven to Dudley station, and thence to Birmingham. Mr. H. Ashton Hill provided a description of the works, which was prepared with happy brevity. It is reproduced on pp. 938-9.

CITY OF BIRMINGHAM WATER DEPARTMENT.

ELAN SUPPLY WORKS.

By E. Antony Lees.

(Secretary of the City of Birmingham Water Department.)

[A Descriptive Account presented to the Association of Water Engineers, June, 1908.]

The Act of Parliament authorizing the Elan Valley Water Scheme is entitled the "Birmingham Corporation Water Act, 1892." It received the Royal Assent on the 27th of June in that year. The following are subsequent Acts connected with the scheme.

The "Birmingham Corporation Water Act, 1896," which authorized certain deviations of the aqueduct, the construction of the short line of railway at Frankley, and gave additional powers for the acquisition of lands for spoil.

The "Birmingham Corporation Water Act, 1902," which authorized an extension of time for construction of works, certain variation of powers with reference to road diversions, a limited capitalization of interest, and a postponement of the sinking fund.

The "Birmingham Corporation Act, 1905," Part IV., which authorized the utilization of the compensation water for the purpose of generating power or light.

The "Birmingham Corporation Water Act, 1907," which authorized a further postponement of the sinking fund.

General Description of the Scheme.

The Act of 1892, as modified by the subsequent legislation, authorized the acquisition by the Corporation of the gathering ground of the upper portion of the River Elan and of its tributary the Claerwen in the Counties of Radnor, Brecknock, Cardigan, and Montgomery. The River Elan is a tributary of the Wye, which it joins about 3½ miles below the Caban Côch, the lowest of the impounding dams. The Act further authorized the construction on the Elan of a series of three impounding reservoirs, and another series of three on the Claerwen, making six in all. The lowest reservoir on the Elan, which extends also into the Claerwen Valley, is for the storage of water for compensation as well as for supply, the other reservoirs being purely for supply. At present only the first instalment of the scheme has been carried out, comprising the compensation reservoir and the two other reservoirs on the Elan, and the foundations of the dam for the first reservoir on the Claerwen; the completion of the last-named reservoir and the construction of the two further reservoirs on the Claerwen being postponed until they are required.

In addition to the impounding reservoirs, the Act authorized the construction of an aqueduct over 73 miles long for the conveyance of the water to Birmingham; also the construction of a receiving reservoir and filter beds at the Birmingham end, and a system of mains to carry the water into the distribution area. Subsidiary features of the scheme were the construction of two small high-level service reservoirs, with rising mains and pumping engines.

The aqueduct works comprised in the first instalment are the tunnel and cut-and-cover sections, constructed of full capacity for the entire yield of the gathering ground, and in the syphon sections two pipes out of the six which will ultimately be required.

The scheme was originated by the late Mr. James Mansergh, F.R.S., Past President Inst.C.E., whose report, dated 8th January, 1891, recommending the scheme, was adopted by the Corporation and formed the basis of the Act of Parliament. After the passing of the Act, Mr. Mansergh was entrusted with the carrying out of the scheme; and in the later years of its execution he was joined by his sons, Mr. Ernest Lawson Mansergh, M.Inst.C.E., and Mr. Walter Leahy Mansergh, M.Inst.C.E., who became Joint Engineers with him.

The reservoir dams and the other works upon or immediately adjoining the gathering ground were carried out by the Corporation by administration. The railway connecting the reservoir works with the Cambrian system at Rhayader,

the aqueduct, the receiving reservoir and filter beds at the Birmingham end, and the laying of the distribution mains were all carried out by contract.

The works were commenced in 1893, and in 1904 were so far completed as to permit of the formal opening. The opening ceremony was performed in the Elan Valley on July 21, 1904, by His Majesty King Edward VII., accompanied by Her Majesty Queen Alexandra.

The water first began to flow into the receiving reservoir at the Birmingham end on July 28, 1904. It was first brought into distribution in September of that year, and the supply was laid on to the entire district of distribution in October, 1905.

The Gathering Ground.

The gathering ground contains a total area of 45,562 acres —that is, over 70 square miles—and has an extreme length of about 15 miles and an extreme breadth of 8 miles. Of this area, 20,515 acres drain into the Elan and 25,047 acres into the Claerwen. The minimum elevation of the gathering ground is 700 feet O.D., that being the level of the river at the site of the lowest dam. Some of the hills round the rim of the watershed rise to elevations of over 2000 feet.

The geological formation is silurian, and consists of shales and flagstones, with some very massive layers of conglomerate. None of the land is cultivated; the whole being occupied as hill pasture restricted to sheep-farming. The Corporation have secured full control over the whole gathering ground of the Elan, and most of that of the Claerwen, by the acquisition of the freeholds and manorial and common rights. The population of the gathering ground is very sparse, there being only 31 houses, occupied by the sheep farmers, who hold their farms under strict regulations for preventing contamination of the streams and reservoirs.

The average annual rainfall over the gathering ground during the ten years, 1898 to 1907 inclusive, on the average of six gauges, was 61·32 inches. For the purpose of calculating the yield, and allowing for a succession of years of exceptional drought, evaporation, percolation, and loss in floods, the yield of the gathering ground has been calculated on the basis of 36 inches per annum. On this basis there is an available yield of 99 million gallons per diem.* Of this quantity, 27 million gallons per diem are appropriated as compensation to the River Wye, leaving 72 million gallons for supply.† The completed scheme provides a total storage capacity of 17,800 million gallons, of which 11,320 million gallons are provided by the works already executed.

The water is of the usual character of waters from moorland gathering grounds; the following being a standard analysis before filtration:—

	Parts per 100,000.
Total solid matter	3·8
Free ammonia	·003
Albuminoid or organic ammonia	·008
Nitrogen as nitrates	0
Oxygen consumed in 4 hours at 27° C (80° Fahr.)	·25
Chlorine as chlorides	0·9
Hardness (as $CaCO_3$)	1·0
Alkalinity (as $CaCO_3$)	0·3
	Appearance in 2 ft. Tube.
Turbidity (*a*)	0
Red (*b*)	1·3
Yellow (*b*)	4·3
Blue (*b*)	0 6

(*a*) "0" indicates "clear."

(*b*) The colour is expressed in tintometer units. Red with an equal amount of yellow forms *orange*, yellow with an equal amount of blue forms *green*, and equal amounts of the three colours indicate *grey*.

Impounding Reservoirs.

The three impounding reservoirs at present constructed have been formed by the erection of masonry dams at Caban Côch, Pen-y-gareg, and Craig Goch. There are a subsidiary submerged dam at Careg-ddu, and the foundations of another dam at Dol-y-mynach. Stone for all these dams and for the other work in the Elan Valley was obtained from two quarries, opened on the same outcrop of conglomerate on opposite sides of the River Elan, adjoining the dam at Caban Côch; the names of the quarries being the Gigfran on the north or left bank, and the Cnwch on the south or right bank. The yield of the quarries was supplemented to a small extent as regards facing and other dressed stone, by importations from quarries in similar measures at Builth and Pontypridd. The dams are all built of cyclopean rubble, embedded in five to one concrete, with a lining up-stream of four to one concrete, 6 feet thick, and are faced up-stream and down-stream with shaped stones arranged in snecked courses. The cement used was all obtained from works on the River Medway.

The dams and all the other works in the Elan Valley were carried out under the supervision of Mr. George Nicholas Yourdi, M.Inst.C.E., as Resident Engineer.

On each of the impounding dams a tablet is fixed giving the following particulars regarding the respective reservoirs:—

Caban Côch Reservoir.

Total capacity, 8,000,000,000 gallons.
Top water area, 500 acres.
Top water level, 822 feet above Ordnance Datum.
Height of dam above river bed, 122 feet.
Depth of foundations below river bed, 25 feet.
Length of weir, 566 feet.
Thickness of dam at base, 122 ft. 6 in.
Estimated quantity of masonry, 144,800 cub. yds.

Pen-y-Gareg Reservoir.

Total capacity, 1,320,000,000 gallons.
Top water area, 124 acres.
Top water level, 945 feet above Ordnance Datum.
Height of dam above river bed, 123 feet.
Depth of foundations below river bed, 17 feet.
Length of weir, 417 ft. 6 ins.
Thickness of Dam at base, 115 ft. 4 in.
Estimated quantity of masonry, 90,372 cub. yds.

Craig Gôch Reservoir.

Total capacity, 2,000,000,000 gallons.
Top water area, 217 acres.
Top water level, 1040 feet above Ordnance Datum.
Height of dam above river bed, 120 feet.
Depth of foundations below river bed, 10 feet.
Length of weir, 390 feet.
Thickness of dam at base, 104 feet.
Estimated quantity of masonry, 80,000 cub. yds.

Compensation Water.

The amount of compensation water is fixed by the Act of Parliament at 27 million gallons per day. The Board of Conservators of the Wye Fishery District have the right to require the Corporation to reserve 5 million gallons per day of the total for 21 days, and to discharge the same in 48 hours. By the Act of 1905, the Corporation obtained powers to utilize the discharge of compensation water for the purpose of generating power to be used on the works, and this is accomplished by means of turbines placed on the pipes conveying the compensation water from the reservoir to the river. The compensation and power houses are situated immediately below the dam at Caban Côch. They are constructed on both sides of the river, the works on the two sides being duplicates of each other. The works on each side are sufficient for the normal discharge of 27 million gallons, but when the reserve water is discharged, the works on both sides are required simultaneously to their full capacity. The compensation water is drawn off at a level of 720 feet O.D., and the turbines are calculated to work at full duty under a head of 26 feet, leaving 76 feet depth of water to be drawn off before there is any curtailment of power.

Each turbine house contains two installations:—

(1) 75 H.P. utilized for generating electricity at 525 volts for power purposes on the filter beds (see below).

(2) 25 H.P. which serves—

(*a*) to pump into the hydraulic accumulator providing a pressure of 700 lbs. to the square inch, used for working valves in connection with the Caban Côch Dam and at the Foel Valve Tower (*q.v.*), and

(*b*) to generate electricity at 220 volts utilized direct or through a system of storage batteries for lighting at the Caban Côch Dam, Foel Valve Tower, Filter Beds, and eventually in the village.

After leaving the turbine houses the compensation water passes through bafflers into the gauge chamber. Here it is discharged through one or more of three orifices, having a

* It may be of assistance to non-technical readers in forming a conception of large volumes of water expressed in millions of gallons to state that a trench one mile long, 10 feet wide, and 3 feet deep would have a capacity of, roundly, one million gallons.

† The aqueduct is designed for 75 million gallons per diem.

capacity of 22, 5, and 12·75 million gallons per day respectively. The quantity discharged is determined by the head of water in the measuring chamber, and is in practice set to a calculated scale. The water passing to compensation is registered on a series of automatic recorders operated by floats. Normally, the 22 and 5 million gallon orifices in one of the houses are open, yielding the full quantity of 27 million gallons per day. When the accumulation of 5 million gallons per day reserved for 21 days is let down, there is a total quantity of 159 million gallons to be discharged in 48 hours—that is 79·5 million gallons per day; and to do this all six orifices are required, *i.e.*:—

22 × 2 = 44 m.g.
5 × 2 = 10 m.g.
12·75 × 2 = 25·5 m.g.

Total . 79·5 m.g. per day.

Submerged Dam at Careg-Ddu.

The Caban Côch Reservoir, as has already been remarked, fulfils the double purpose of providing water for compensation and for supply. The compensation water is discharged at the Caban dam at a level of 720 feet above O.D. The point of delivery at the Birmingham end of the aqueduct is 600 feet above O.D.; and, in order to ensure a proper fall on the aqueduct it was necessary that the water for supply should be drawn off at a considerably higher level than 720 feet O.D. The point fixed upon was Careg-Ddu, where the aqueduct starts with an invert level of 770 feet O.D. at a point on the left bank of the reservoir, 1½ miles above the Caban Côch dam. From the levels given above it is evident that, if the reservoir were continuous, the water level could never have been drawn below 780 feet O.D.—that is the point of submergence of the entrance to the aqueduct; and, under these circumstances, the whole of the water stored below that level would be entirely useless. In view of this, the device has been resorted to of constructing a subsidiary dam immediately down-stream of the head of the aqueduct, and having a weir level of 782 feet O.D. A viaduct is built by parliamentary requirement over the submerged dam to carry a road giving access to the Claerwen Valley.

By means of the submerged dam, the Caban Côch reservoir is divided into three portions:—

(*a*) A stratum 40 feet thick from 822 feet to 782 feet O.D., extending over the whole area of the reservoir, and containing 4585 million gallons. This quantity is available both for compensation and supply.

(*b*) The portion of the reservoir below the weir level of the submerged dam (782 feet O.D.) and situate between that dam and the Caban Côch dam. This second portion has a capacity of 2565 million gallons, and is available for compensation only.

(*c*) The section of the reservoir up-stream, and below the weir level, of the submerged dam. This section must always be kept full in order to charge the aqueduct, and when the Caban Côch reservoir is drawn down to the 782 feet O.D. level that level will be maintained in this third section by drawing from the Pen-y-gareg and Craig Gôch reservoirs on the River Elan, and also, by means of the Dol-y-mynach tunnel (see below), from the Dol-y-mynach and other reservoirs on the River Claerwen.

Dol-y-mynach Dam.

Following the road across the viaduct for a distance of 1½ miles the incomplete Dol-y-mynach dam is reached. The site fixed upon for this dam is submerged when the Caban Côch reservoir is full. It was consequently considered prudent to put in the foundations of the dam during the construction of the works comprised in the first instalment. This has been done; the dam being carried to the level 830 feet O.D. It will eventually be carried up to 900 feet O.D. At present the Dol-y-mynach reservoir has an area of 26 acres and contains 150 million gallons. When completed it will have a top water area of 148 acres and a capacity of 1500 million gallons. A short distance up-stream from the Dol-y-mynach dam a low tower marks the entrance to the Dol-y-mynach tunnel. The tunnel is constructed for the purpose of conveying the waters of the Claerwen into the Caban Côch reservoir. Its outlet is at a point above the submerged dam (Careg-ddu) thereby making the Claerwen reservoirs available for supply. This tunnel measures 1 mile 437 yards long. The invert level at the inlet is 823 feet O.D. and at the outlet 802 feet O.D.

Foel Valve Tower.

The head of the aqueduct is marked by the Foel Valve Tower, situate immediately up-stream of the Careg-ddu Viaduct. The level of the summit of the dome is 877 feet O.D.—that is, 55 feet above top-water level of the reservoir. The draw-off pipes in the base of the tower have an invert level of 770 feet O.D. The entire height of the tower above the draw-off is, therefore, 107 feet, of which 52 feet are submerged and 55 feet are above water. In the walls of the tower there are a series of orifices at different depths, providing free communication with the body of water in the reservoir. Within the tower is a dry well constructed of blue bricks and having an internal diameter of 12 feet. Between the outer wall of the tower and the dry well are three upstand pipes. Each of these is 6 feet in diameter, and is composed of cylinders 6 feet in length, except the top section of each. These are respectively two, four, and six feet long. Each column of cylinders is capable of being raised so as to form an opening between any two lengths. This device provides the means of drawing water from one or other of the three cylinders at steps of two feet throughout the whole depth of the reservoir down to 770 feet O.D. All of the pipes terminate in the inlet chamber of the aqueduct. They are controlled by valves, and each of them is capable of discharging the entire maximum supply of 75 million gallons per day under the minimum head provided at 782 feet O.D. The apparatus for lifting the cylinders and working the valves is operated by hydraulic power at a pressure of 700 lbs. to the sq. in., accumulated in the turbine houses below the Caban Dam (see above).

Filter Beds.

The Foel filters did not form part of the original scheme. The decision to provide them was arrived at in the year 1901 in view of the experience of Liverpool, which showed that the discharging capacity of lines of iron pipes conveying water from a similar gathering ground was liable to serious diminution in consequence of a growth forming on the interior of the pipes. As it was proved at Liverpool that this growth was prevented by filtration, it was decided to provide filter beds at the head of the aqueduct, and the construction of the filters at the Foel was undertaken. The filters are thirty in number. Their dimensions, with slight individual variations, are 80 ft. by 50 ft., the total filtering area being 120,000 sq. ft. The filtering material is formed of layers of shingle graded up to rough sand. The water before reaching the filters has to pass upwards through strainers of copper gauze of a mesh of 40 threads to the inch. The rate of filtration is about 16 inches per hour, the process being rather rough filtration or mechanical straining than bacterial purification. The desired result, however, is secured, as hitherto there have been no signs of deposit in the pipes on the aqueduct. The filters are provided with gauges for determining the filter head which furnishes data for calculating the quantity of water passing through each filter. The water from all the filters passes into the filtered water culvert constructed along the north side of the beds. From this culvert the water passes through a gauging chamber where it is measured by a differential self-recording apparatus, and thence into the Elan Conduit (see description of aqueduct below).

The method of cleansing and renewing the filters which has been adopted since the works came into use has been designed and carried out by Mr. F. W. Macaulay, M.Inst. C.E., the Engineer in administrative charge. The washing stages are now situate at the west end of the beds and the sand is conveyed to and from the filters by means of conveyors running on an overhead railway operated by electric energy generated in the turbine houses. What has been termed the "reservation system" of renewing the sand has been adopted, the method being the following: When a bed becomes blocked, a layer of one inch or more, as may be required, is skimmed off and removed to the washing stage. The filter is then re-started without resanding; successive layers of dirty sand being taken away until the stratum of sand remaining in the filter is reduced to the minimum consistent with efficient working. The remainder of the sand is then removed to one side and the filter entirely re-made with clean sand at the bottom and the removed sand at the top. Sand which has been washed and is awaiting replacement on the filters is stored in two filter basins at the inlet end which are temporarily converted into sand stores.

The water from the sand washers containing the peaty

material removed from the sand flows into a settling tank, from which the deposit is removed periodically by means of a rotary pump driven electrically.

Treatment of Water.

In consequence of the water, notwithstanding that it is alkaline in its reaction, possessing some slight power of eroding lead when allowed to stand overnight in lead service pipes, the Medical Officer of Health of the City considered it prudent to introduce a small quantity of hardening matter. The medium adopted is finely powdered chalk, and the proportion at present used, and which has proved effective, is 1½ grains per gallon. At the time of writing this paper a permanent building and apparatus for introducing the chalk are being designed by Mr. Macaulay, and will be erected during this summer. The position of the chalking house will be immediately east of the gauge chamber. The chalk store adjoins the west end of the filters and the material will be conveyed by means of the overhead electric railway.

The Aqueduct.

The aqueduct commences at the Foel Valve tower (see above) and terminates at the Frankley reservoir, near Birmingham (see below). Its length is 73 m. 2 f. 9 ch. 20 yds. It consists of sections in—

(*a*) Tunnel—nine sections over 500 yards each—11 m. 5 f. 6 ch. 0 yds. long.

(*b*) Cut-and-cover—nineteen sections—25 m. 0 f. 0 ch. 16 yds. long (including six short tunnels, none exceeding 500 yards in length, totalling 1 m. 1 f. 4 ch. 16 yds.), and,

(*c*) Syphon or pipe line—eleven sections—36 m. 5 f. 3 ch. 4 yds. long.

The sections in tunnel and cut-and-cover have all been constructed of sufficient capacity to convey 75 million gallons per day. The tunnels and cut-and-cover sections are all lined throughout with blue brick, and, except as regards the method of opening-out, are exactly similar. All of these sections are constructed with arched roof and invert, with nearly straight sides. The normal section with some slight local variations is, height 8 feet, width at invert 7 ft. 2 in., and at the springing of arch 8 ft. 2 in.

The pipes in the syphons are of 42-inch internal diameter. They are of cast iron, except some lengths on the Hopton Brook and Severn syphons, where the pressure exceeds 150 lbs. per square inch. These sections are constructed of lap-welded steel tubes.

To deal with the total yield of 75 million gallons per day, six pipes will be required in the syphon sections. At present two pipes only have been provided, and additional pipes will be added as required.

Administration of Aqueduct.

To facilitate administration, a private telephone has been provided, starting in the Elan Valley, traversing the entire length of the aqueduct, and terminating in the Birmingham office. The aqueduct is divided into eleven sections, each section being in charge of a walksman, and a telephone instrument in connection with the aqueduct system is fixed in each walksman's cottage.

The chief officer in connection with the administration of the aqueduct, including the works in the Elan Valley and at Frankley, is the "Elan Supply Resident Engineer," Mr. F. W. Macaulay, M.Inst.C.E., whose office is at Ludlow. To enable him to cover the works in his charge he is provided with two motor cars.

Each of the syphon lengths is perambulated daily by one of the walksmen. Upon the walksmen also devolves the duty of adjusting valves, &c., for effecting alterations in flow, and of taking measures for dealing with interruptions.

At salient points on the aqueduct depôts are established containing a supply of spare pipes with the necessary plant for dealing promptly with any burst. To ensure a minimum waste of water in case of a burst, automatic valves are fixed at the inlets of all the principal syphons. These are furnished with electric attachments to alarums in the cottages of the walksmen.

Frankley Works.

The water enters the receiving reservoir at Frankley through a gauge chamber fitted with a self-recording differential gauge. From the gauge chamber the water enters the inlet basin, whence it is delivered either into one or both of the divisions of the reservoir, or direct to the outlet valve wells situated in the domed buildings on the north-west and south-west sides of the reservoir.

The reservoir is semicircular in plan, and has a top water area of about 25 acres. The depth varies from 30 to 35 feet, and the total capacity is 200 million gallons. It is constructed of concrete lined with asphalte, the latter being uncovered on the floor, and having a blue brick facing on the walls. The reservoir is divided into two equal portions by a main division wall 600 feet long. The east straight wall is nearly one-third of a mile in length, and the total distance all round the reservoir is about four-fifths of a mile. The water enters the reservoir from the inlet chamber over a series of stone steps or sills extending to the floor. Since the reservoir came into use, it has been found advisable to use one-half of it as a settling tank—the water being drawn off for use from the other half; and communication between the two has been provided for this purpose by cutting down the division wall so as to form a weir in two lengths of 50 feet each. The two halves of the reservoir can be used interchangeably as settling tanks and draw-off tanks.

From the outlet wells, the water passes on to the filter beds. These are eighteen in number, and have a combined area of about 14 acres. The total normal thickness of the filtering material is 4 ft. 9 in., having an upper section of 2 ft. 9 in. of fine sand. The normal rate of filtration is 3½ inches per hour. The method adopted for cleansing and re-sanding the filters since the works were opened has been designed and carried out by Mr. F. W. Macaulay. These comprise the provision of fixed washing apparatus, with stages for storing washed sand, and include a system of light railways for conveying the unwashed sand to the washers and distributing the washed sand to the filters. The filters are now dealt with by the "reservation" method, already described in connection with the Foel filters.

From the filters the water enters the covered filtered water tank. Originally, this had a capacity of 500,000 gallons. It was considered advisable, however, to supplement this; and an additional filtered water tank was designed by Mr. Macaulay, and has been constructed under his superintendence. The new tank has a capacity of 7·5 million gallons, and communicates directly with the original, the two forming in practice one filtered water reservoir with a capacity of 8 million gallons.

The following is a standard analysis of the water as sent to distribution:—

	Parts per 100,000.
Total solid matter	7·2
Free ammonia	·000
Albuminoid or organic ammonia	·002
Nitrogen as nitrates	0
Oxygen consumed in 4 hours at 27° C (80° Fahr.)	·14
Chlorine as chlorides	1·0
Hardness (as $CaCO_3$)	3·0
Alkalinity (as $CaCO_3$)	2·9
	Appearance in 2 ft. Tube.
Turbidity*	0
Red†	0·2
Yellow†	2·2
Blue†	0

* "0" indicates "clear."
† The colour is expressed in tintometer units. Red with an equal amount of yellow forms *orange*, yellow with an equal amount of blue forms *green*, and equal amounts of the three colours indicate *grey*.

Engines are provided for pumping a small portion of the supply into two high-level service reservoirs, one at Northfield and the other at Warley. In consequence of the rapid growth of the population in the high-level districts served from these reservoirs, an additional engine has been recently put down to supplement the three originally provided. The water distributed by gravitation is taken into distribution by means of three 42-inch mains, one to the low level and two to the middle level. Each of these at the point of leaving the valve house is fitted with a Venturi meter with self-recording apparatus showing the quantity of water passing. The two rising mains from the pumping engines are also fitted with self-recording Venturi meters.

The whole of the houses and works are lighted by electricity generated in the engine-house. The principal valves, penstocks, &c., are operated by hydraulic power distributed from the central station at a pressure of 700 lbs. to the square inch.

Cost of the Scheme.

The parliamentary estimate of the cost of the entire scheme was £5,851,000; and the estimate for the works originally included in the first instalment was £3,755,350.

As the works progressed, it became apparent that the cost would considerably exceed the estimate. It became, moreover, necessary to include certain additional works, such as the filter beds at the Foel, not originally provided for; also the foundations of the Dol-y-mynach dam were undertaken, which had not been included in the estimate of the first instalment. Revised estimates were then prepared, and the Water Committee on March 4, 1902, submitted to the City Council a report reviewing the circumstances and submitting an estimate of £5,884,918 as the estimate of the ultimate cost of the first instalment, being £2,129,568 in excess of the parliamentary estimate. Of this excess, £750,000 was stated by the Engineer to represent the cost of works not included in the original estimate for the first instalment. The works on the watershed account for £756,425 of the excess. This was explained by the Engineer on the following grounds:—

(1) The necessity of making the foundations of all the dams deeper and longer than was anticipated.
(2) The failure to find suitable building stone in the neighbourhood of any of the dams except Caban Côch.
(3) The necessity of importing considerable quantities of stone owing to restricted local facilities in consequence of only the two quarries at Caban Côch being available.
(4) Considerable increase in wages and materials over the rates prevailing when the original estimate was prepared.

The works carried out by contract on the aqueduct and at Frankley account for the remainder of the excess, which is attributable in part to obligations imposed by Parliament, general increase in the cost of material and labour, and to various special local circumstances.

The expenditure on the scheme up to March 31, 1908, was £5,762,853, as against the ultimate estimate of £5,884,918.

THE SOUTH STAFFORDSHIRE WATER COMPANY'S WORKS.

By H. Ashton Hill, M.Inst.C.E., Engineer.

[A Descriptive Account presented to the Association of Water Engineers, June, 1908.]

Ashwood Pumping Station.

This station has been extended twice since it was originally designed. The engines now pump through supply mains controlled by the Springs Mire reservoir, about five miles away. The mains are 15-inch and 18-inch diameter for the first two miles, after which they merge into one 20-inch main.

The first works, which were completed in May, 1893, comprised two boreholes 24-inch diameter in the clear, lined with steel tubes, an engine-house with one horizontal Davey-type engine to pump one million gallons per diem, a boiler house with three Lancashire boilers, a chimney 4 ft. 4 in. diameter at the top and 103 feet high, and five cottages.

The first extensions were finished in December, 1900, and comprised two boreholes each 33-inch diameter in the clear to a depth of 292 feet, and 18-inch diameter for a further distance of 209 feet in one case, and 43 feet in the other case; an engine house containing one horizontal Davey-type engine to pump 2¼ million gallons per diem, and two Lancashire boilers, which were accommodated in an extended part of the existing boiler-house.

As a plentiful supply of water was available, the station was extended a second time two years ago. These extensions comprised two boreholes, each 30-inch diameter in the clear, to a depth of 300 feet, and 18-inch diameter for a further distance of 303 feet in one case, and 311 feet in the other case; an engine house containing one horizontal Davey-type engine, to pump 2¼ million gallons per diem, and a boiler-house containing three Lancashire boilers. The old delivery mains were taken up round about the station, and replaced with one larger main 30-inch diameter.

The levels of all the engine-house floors are 212 feet above O.D.

The first engine put down is capable of pumping 1,000,000 gallons against a head of 680 feet, at a speed of 14 double strokes per minute; the pump H.P. being 150. The second engine is capable of pumping 2¼ million gallons against a head of 738 feet at a speed of 11·66 double strokes per minute; the pump H.P. being 367. The third engine is capable of pumping 2¼ million gallons against a head of 688 feet, at a speed of 11·66 double strokes per minute; the pump H.P. being 342.

The total cost of this station, including an acre and a half of land and the five cottages, has been £53,094; and the quantity of water pumped therefrom is 3½ million gallons per diem.

Hinksford Pumping Station.

This station was completed in September, 1901. The engines pump through a 15-inch supply main, which is controlled by the Springs Mire reservoir, about 5 miles away.

The works comprise an engine-house containing two marine-type engines, complete with well and force pumps; a boiler-house containing three Lancashire boilers with Vicar's mechanical stokers and a Green's economizer; and a 12-feet diameter well, 72 feet deep from the engine house floor. The level of the engine-house floor is 210·24 feet above O.D.

The two engines are of the compound marine type, and are each capable of pumping 1½ million gallons per 24 hours against a total head of 590 feet, including friction, at a speed of 17½ revolutions per minute. Stroke 4 feet, the diameters of the cylinders are: H.P. 22 inches and L.P. 53 inches, and the force-pump and well-pump barrels are 16 inches diameter. The pump H.P. of each engine when working at full power equals 197.

The three Lancashire boilers, which are 8 feet diameter by 30 feet long, are worked by a chimney 110 feet high, with an opening at the top of 4 feet. The economizer has a heating surface of 800 square feet.

The well is 12 feet diameter inside the brickwork, and is 64 feet deep from the original ground level. It is steined from top to bottom with 9-inch brindled brickwork in cement mortar.

The principal items of cost were as follows:—

	£
Land	372
Well sinking	2,178
Buildings: Engine house, boiler house, chimney stack, and cottage	6,862
Engines, pumps, and boilers	15,592
Sundries	1,661
Total	£26,665

Springs Mire.

COVERED SERVICE RESERVOIR.

The site on which this reservoir is constructed was originally occupied by a colliery; it falls short of perfection in two ways at least. In the first place, for some 10 feet in depth it was nearly all made-ground, composed of colliery slack and refuse; and, secondly, there were several seams of unworked coal cropping out in the foundations. Apart from this, the ground was good strong clay. The coal seams were reached during excavation in the clay and the outcropping coal removed; the space occupied by it being filled up with concrete. The contractor used some of the coal in his boiler.

The reservoir is lined with puddle on the outside; 2 feet thick at the sides, 1 foot thick on the top. The floor is composed of concrete (five parts of blast furnace slag and sand to one part of Portland cement) 12 inches thick, except in places where the ground was bad, where it was made thicker. The side walls up to the springing of the arches are of concrete 4 ft. 6 in. thick, lined on the inside with Staffordshire blue brickwork, 18 inches thick, in cement mortar. The roof is composed of arched brickwork, the end arches being 14 inches thick and the remaining arches 9 inches thick. It is supported by 130 brickwork columns 2 ft. 3 in. square, spaced 14 ft. 3 in. and 13 ft. 5 in. apart. The width of the columns at the springings of the arches is 18 inches. The rise from the springings to the centres of the arches is 1 ft. 4½ in.

The original 18-inch diameter inlet pipe which is connected to the supply main from Ashwood is laid in a sump, and this pipe also serves as an outlet. More water having been obtained at Hinksford and Ashwood pumping stations, an additional main 20 inches diameter was laid to this reservoir, and carried into it above top-water level.

There are twelve holes, 4½ inches square, in the centres of some of the arches for ventilating purposes, and two manholes 3 feet square, for getting into the reservoir. The level of

The Springs Mire Reservoir of the South Staffordshire Water Company during Construction.

water is shown on a pneumatic gauge fixed in the engine-house.

The reservoir, which is 200 feet long by 150 feet wide, was constructed in fourteen months; being completed in December, 1897. It holds 3,250,000 gallons when full—that is, with a depth of 17 feet of water. The surface area at the top is 30,000 square feet.

The top water level is	605·25 O.O.D.
The cost of land was	£857 8 9
And of the reservoir	£14,832 12 9

Although the colliery workings had ceased 34 years previously, the reservoir settled 2 inches, and began to leak when the water was let into it. It fortunately went down fairly evenly, but the walls cracked in several places. As the settlement did not go any further, the reservoir was rendered in cement, which made it perfectly tight, and it has remained so ever since.

This reservoir, a view of which during construction is shown herewith, controls the supply to several towns in the Black Country, among which are Netherton, Brierley Hill, Quarry Bank, Cradley Heath, and Old Hill, the consumption in these towns averaging 1½ million gallons per day. Some 3½ million gallons per day are re-pumped from Springs Mire reservoir into Shavers End reservoir, at an elevation of 743·90 feet O.O.D., whence a gas-engine pumps some 200,000 gallons per day into Sedgley Beacon reservoir, at an elevation of 781·22 feet O.O.D.

PUMPING STATION.

This is a station for re-pumping a portion of the water from the Springs Mire reservoir into Shavers End reservoir (having a capacity of 5 million gallons) 1¼ miles away, which serves the higher parts of Dudley, Smethwick, Oldbury, Tipton, &c. The station, as originally designed, with two horizontal reciprocating engines and two boilers, was completed in August, 1901. The extensions comprise a centrifugal pumping plant, one boiler, new engine-house, and extended boiler-house.

The two horizontal compound engines are capable of pumping 2,000,000 gallons each per 24 hours against a total head of 162 feet, including friction, at a speed of 22½ revolutions per minute. Stroke, 4 feet; cylinders, 15-inch and 31-inch diameter respectively; diameter of the force pump, 16 inches; and the pump H.P. of each engine, 71.

The centrifugal pumping plant is designed to pump 4,000,000 gallons per 24 hours against a head of 175 feet, including friction. The engine is one of Messrs. Belliss and Morcom's well-known patent compound self-lubricating enclosed engines. The cylinders are 12-inch and 19-inch diameter respectively, and the stroke is 10 inches. The B.H.P. is 210, at a speed of 390 revolutions per minute. The high-lift centrifugal pump is coupled direct to the engine. It is a three-stage pump of Messrs. Mather and Platt's manufacture.

The water delivered by the centrifugal pump is measured by a 24-inch Venturi meter having a throat ratio of 6 : 1.

The three Lancashire boilers, which are 6 ft. 6. in. diameter by 28 feet long, are worked by a steel chimney stack 3 ft. 9 in. diameter and 100 feet high.

THE COSTS INVOLVED.

The principal items of cost are as follows:—

Original Scheme.

Buildings, engine-house, and boiler-house	£4,452
Two engines and pumps, two boilers, and economizer	6,349
Steel chimney and other works	707
Total	£11,508

Extensions.

Engine and boiler houses	£1,744
Boiler and Meldrum furnaces	538
Centrifugal pump, high-speed engine	1,849
Venturi meter, connections, &c.	1,234
Total	£5,365

After this station had been at work for a year, some of the coal under and close to the boiler-house, which had not been removed, caught fire and began to burn slowly. As the walls at the same time began to crack, it was found necessary to immediately dig out all the coal and slack round about, and to underpin the boiler-house, one portion at a time, in order to remove all the coal under same. While the coal, which was in a state of combustion and red hot, was being removed, the foundations of the boilers were propped up with brick piers under the concrete. The excavations were afterwards filled in with concrete. The boilers were kept at work during the whole of the time.

Birthday Honours.—In the list of honours conferred by His Majesty on the occasion of the official celebration of his birthday, are knighthoods for Colonel Charles Allen, a Director of the British Coalite Company, and Mr. R. Abbott Hadfield, one of the Directors of the Sheffield United Gas Company.

Mr. Bywater's Gas Institution Paper.—In their issue of the 27th inst., the "Builder" says: A scathing criticism of the methods of testing fire-clays adopted by British manufacturers formed part of the subject-matter of a paper, on "Refractory Material," communicated to the Institution of Gas Engineers at their annual meeting. The author of the paper was Mr. F. J. Bywater, the Gas Engineer in charge of the Saltley works of the Birmingham Corporation. Mr. Bywater has had extensive experience with fire-bricks and fire-clay retorts used for gas manufacture. His paper is excellent, and should be perused by all manufacturers of fire-clay goods. But we do not think he is altogether justified in ascribing the alleged superiority of German fire-clay ware to the more scientific methods of investigation adopted by German manufacturers. For some years past there has been a tendency to overrate the powers of the chemist. Every large factory should possess a laboratory and a chemical staff; but there is a limit to the power of science. However, Mr. Bywater is probably correct in saying that thorough investigation and proper treatment of the excellent fire-clays which still remain unmined in this country will restore British fire-clays to their pre-eminence—if they have, indeed, lost it.

THE LATEST DEVELOPMENT OF GAS-MAKING SETTINGS.

By Mr. E. KÖRTING, the General Manager at Berlin for the Imperial Continental Gas Association.

[Abstract Translation of a Paper presented at the Meeting of the German Association of Gas and Water Engineers at Berlin, June 18.]

We have again, thank heaven, life and activity in the German gas industry. The epoch-making invention of Welsbach, now culminating in the inverted and the high-pressure incandescent gas lights, has been followed by radical reform in gas manufacture. Dr. Bueb has carried out his fundamental researches at Dessau, Herr Ries and his staff have worked successfully at Munich, and other inventors are emulating these pioneers. But though this competition is useful, and this luxuriant crop of new ideas and proposals is gratifying at the time, it has this great disadvantage—that it is extremely difficult to take a survey of them all. The Council of the Association have, therefore, deemed it expedient that the results so far obtained should be exhaustively discussed at this meeting, and light thrown upon them from different sides, and thus a certain clearness arrived at. The author asks to be allowed to prelude the general discussion with a few introductory remarks.

The first question is, What does the gas consumer require? He wants for his sensitive inverted light a gas constantly of exactly the same calorific value and the same specific gravity. It is no longer a question of high calorific value or even illuminating power. A gross calorific value of 5000 calories per cubic metre (562 B.Th.U. per cubic foot) is amply sufficient. What duty and obligations do these facts of the case throw upon the gas manager? He must increase the make per ton of coal, but must, however, anxiously bear in mind that the calorific power of his gas must not fluctuate. Both for increasing the make and for controlling the quality, water gas has been, and is, a valuable ally. But it has now been learnt that water gas can be made in the carbonizing chambers themselves, provided they are filled up to the top with coal. A further advantage of completely filled retorts is that the volatile products of distillation acquire a very high rate of flow, and, consequently, the subsequent destruction of hydrocarbons and ammonia by the heat is in large measure avoided. We are therefore all well agreed now that carbonization in completely filled chambers is correct. But we all know also—or, at least, think we know, from our practice—that carbonization proceeds most swiftly and with the least expenditure of fuel in small retorts with thin charges of coal. If, therefore, we fill our retorts completely, and, further, if we enlarge them to wide and big chambers, we should expect *a priori* that carbonization would be made less easy and that larger settings and more fuel would really be required for the same productive capacity. For the comparison of the results of existing types of settings, the questions therefore which press for consideration are: What is the effect of the changing ratio of the retort heating surface to the unit weight of coal to be carbonized on (1) the quantity and quality of the gas, tar, and ammonia, (2) the dimensions of the setting, and (3) the fuel required to heat the setting. But the answer or comparison is rendered a very difficult matter in practice by two circumstances. Horizontal and inclined retorts or chambers are at the same heat throughout their length; whereas vertical retorts are subjected to the full heat only quite at the lower part. The former work also with, and the latter without, a receiving or hydraulic main, so that in the one case gas can escape outwards through positive pressure, and, in the other, it will be drawn in through negative pressure. Besides answering the foregoing carbonizing technical questions, we must also arrive clearly at what economical value can be claimed for the different working results. With this in view, the author has calculated tables, attached to this paper, which are intended to facilitate this survey. Tables I. and II. led to the conclusion that high capital outlay has a very strong effect on the profitableness of the installation, as has also, but in less degree, the expenditure on wear and tear. Table III. shows that workmen's wages are of much less significance. It must not be forgotten that it is in the main only the work of charging and discharging the retorts that can be diminished, and this is already extremely small with inclines and with stoking machinery and horizontals. With inclines, 0·6d. per 1000 cubic feet is little, 0·2d. with vertical retorts practically nothing. If it should come about that this latter sum is still further reduced by 100 per cent., then a whole tenth of a penny per 1000 cubic feet would be the reward for our trouble. According to Table IV., a great increase in the make of gas per ton of coal is more valuable. It must, of course, as in the table, be taken in conjunction with the coke produced and the fuel consumption. When the fuel consumption reaches a certain point, the whole advantage naturally is swallowed up thereby. For example, it amounts to the same thing whether 10,765 cubic feet of gas per ton are made with a fuel consumption of 12 per cent., or 12,920 cubic feet with a fuel consumption of 20 per cent. The coke which is produced in completely filled carbonizing vessels is much harder and tougher than ordinary gas coke, but, sold according to weight, has no higher fuel value, and cannot therefore be ascribed any considerably higher price per ton. On the other hand, the reduction in the breeze formed is of greater economical importance, as Table V. indicates. The improvement in the tar and ammonia produced likewise comes appreciably into account, as is evident from Tables VI. and VII. If, therefore, it is desired to compare the performances from the economical standpoint of the present types of settings, the proper course is to ascertain definitely the costs of installation and the working results, and place them side by side for consideration.

In conclusion, the author would refer to one technical question as to the working. The view has often been expressed that 24-hour intervals between the chargings would have the great advantage that night work would be avoided. The author conceives this view to involve a dangerous fallacy. The old and well-tried method of distributing the gas production uniformly over the 24 hours he believes now, as hitherto, is fully justified by the facts that it is only thus that gas of the uniform quality which is required can be produced, and that only in this way can the apparatus be employed to the full extent, which is alone consistent with economical working. A warning is afforded by the coke-ovens, which naturally are designed for coke and not gas making. The gas from them, if the author is correctly informed, is liable to fluctuations in calorific value to the extent of several hundred British Thermal Units.

With this remark, the author would conclude his introductory observations, which make no claim to completeness, and in the name of the Council of the Association would ask the meeting to take up as fully as possible the discussion of this highly-important question.

TABLE I. (*Abridged.*)—*Redemption* (5 *per Cent.*) *and Interest* (5 *per Cent.*) *Charges on the Cost of Installation of a Setting, per* 1000 *Cubic Feet of Gas Made per Annum.*

Cost of Installation.	Capacity of Setting Cubic Feet. { Per Diem. { Per Annum.	87,500 17,500,000	175,000 35,000,000
£		d.	d.
1000		1·36	0·68
1500		2·04	1·02
2000		2·72	1·36
2500		3·40	1·70
3000		4·08	2·04
3500		4·76	2·38
4000		5·44	2·72

TABLE II.—*Annual Maintenance Charges* (*Wear and Tear*) *per* 1000 *Cubic Feet of Gas made with Different Types of Settings.*

—	Settings.	Stokers' Tools.	Drawing and Charging Machinery.	De Brouwer Coke Conveyor.	Trolleys and Wheelbarrows.	Total.
	d.	d.	d.	d.	d.	d.
Direct-fired settings, horizontal retorts	0·74	0·40	..	..	0·08	1·227
Producer-fired settings, horizontal retorts, with drawing and charging machines . .	0·77	0·31	0·12	..	0·09	1·295
Inclined retort settings . . .	0·52	0·27	..	0·10	..	0·894

TABLE III. (*Abridged.*)—*Wages for Charging and Discharging Retorts or Chambers per* 1000 *Cubic Feet of Gas Made.*

Number of Hands per 24 Hours	Wages.	Thousands of Cubic Feet of Gas Made per 24 Hours.					
		700	1050	1400	1750	2647	3500
	£ s. d.	d.	d.	d.	d.	d.	d.
9	2 9 11	0·85	0·57*	0·42	0·34	0·23	0·17
6	1 13 4	0·57	0·38	0·28	0 23	0·15	0·11
4	1 2 2½	0·38	0·25	0 19†	0·15	0·10	0·075
2	0 11 1	0·19	0·13	0·095	0·075	0·050	0·038
1	0 5 6½	0·095	0·063	0·047	0·038	0·025	0·019

* Inclines at Berlin. † Vertical retorts at Mariendorf, Berlin.

TABLE IV. (*Abridged*).—*Effect of Increase in Make per Ton of Coal on the Cost of Production, as shown by the Cost of Coal, minus the Value of the Coke produced, but plus the Fuel Consumed in the Furnaces, per* 1000 *Cubic Feet of Gas Made.*

Make. Cubic feet per ton . .	10,765	11,480	12,200	12,920	13,635	14,350
Cost of coal at £1 per ton . Pence	22·6	21·2	20·0	18·9	17·9	17·0
Coke—70 p. ct. of Coal . ,,	15·8	14·9	14·0	13·2	12·5	11·9
Coal *minus* coke . . . . ,,	6·8	6·3	6·0	5 7	5·4	5·1
Do. do. do.						
Plus furnace fuel amounting to—						
12 p. ct. of the weight of coal ,,	9·5	8·9	8·4	7·9	7·5	7·1
14 ,, ,, ,, ,, ,,	10·0	9·4	8·8	8·3	7 9	7·5
16 ,, ,, ,, ,, ,,	10·4	9·8	9·2	8 7	8·2	7·8
18 ,, ,, ,, ,, ,,	10·9	10·2	9·6	9·0	8·6	8·2
20 ,, ,, ,, ,, ,,	11·3	10·6	10·0	9·4	8 9	8·5

TABLE V. (*Abridged*).—*Effect of Reduction in Formation of Breeze Owing to the Greater Hardness of the Coke on the Value of the Coke and Breeze Produced per* 1000 *Cubic Feet of Gas Made.*

Coke valued at 20s. per ton ; Breeze, at 5s. per ton.
Coal yields 70 per cent. of its weight of coke and breeze.

Make. Cubic feet per ton	10,765	11,480	12,200	12,920	13,635	14,350
Coke 60 per cent., Breeze 10 per cent. Pence	14·2	13·3	12·5	11·8	11·2	10·6
Coke 65 per cent., Breeze 5 per cent Pence	15·0	14·1	13·3	12·5	11·9	11·2
Coke 70 per cent., Breeze *Nil*. Pence	15·9	14 9	14·0	13·2	12·5	11·9

TABLE VI. (*Abridged*).—*Value of the Ammonia per* 1000 *Cubic Feet of Gas Made.*

True ammonia taken as worth 3¼d. per lb.

Yield of True Ammonia in Percentages of the Weight of Coal Carbonized.	Make. Cubic Feet per Ton.	10,765	11,480	12,200	12,920	13,635	14,350
0·20	Pence	1·36	1·29	1·19	1·12	1·09	1·02
0·24	,,	1·63	1·53	1·43	1·36	1·29	1·22
0·28	,,	1·90	1·77	1·67	1·60	1 50	1·43
0·32	,,	2·18	2·04	1·90	1·80	1·73	1·63

TABLE VII.—*Value of the Tar per* 1000 *Cubic Feet of Gas Made.*

Make of tar per ton of coal taken at about 101 lbs., valued at 11d.

Make, cubic feet per ton .	10,765	11,480	12,200	12,920	13,635	14,350
Value of tar, pence . . .	1·36	1·29	1·19	1·12	1·09	1·02

Note.—Vertical retorts yield per ton of coal 1 cwt. of tar, value 1s. 2½d.

PRODUCTION OF NAPHTHALENE IN THE HYDRAULIC MAIN.

By MM. F. & L. CHEVALET.

[A Paper read before the Société Technique du Gaz.]

The authors refer to the washer-condenser of M. Chevalet, described before the 1882 Congress, in which they outlined the method of removing naphthalene on the lines proposed by Dr. Bueb in 1900—the latter's method being the use of anthracene oil for the solution of the naphthalene. Although Dr. Bueb stated that a special washer was not necessary for the process, it was only in 1907 that it was found possible at the N—— Gas-Works to install the Chevalet washer-condenser as a naphthalene washer. The works employed 6000 tonnes of coal per annum.

The apparatus consists of a washer-condenser of old pattern treating 10,000 cubic metres of gas per day of 24 hours. It is placed between a battery of two washer-condensers of 5000 metres capacity and of the same pattern (both of which are supplied with ammoniacal liquor for the absorption of the tar) and a Chevalet scrubber. The oil flows continuously into the apparatus, which is kept supplied by means of a pump attached to the feed-tank. This latter is provided with a steam-coil in order to bring the oil to the required temperature. The apparatus has been working since July, 1907, and has given good results; no naphthalene being deposited in the purifiers or on the surface of the purifying material.

It is found advisable to sprinkle the upper plates of the apparatus with fresh oil while the lower plates are receiving oil already saturated with naphthalene. A system of three pumps might well be used—each withdrawing oil of a different capacity of saturation. Thus modified, the apparatus would certainly give the best results; but the cost of the alteration would be too great as applied to the present apparatus.

It is, therefore, now proposed, in order to fulfil the above conditions, to employ the principle of the washer-condenser, but to modify the construction so that the washing-plate is constantly immersed in the oil. Each wash-tray is constructed after the manner of the plate in a distillation column. It is provided with a base portion and a weir overflow; and the wash-plate forms the upper part of the scrubber cap. In this way, the bubbles of gas are exactly the size of the holes in the plate, and escape from a horizontal surface, while in the case of the cap of the scrubber in an ordinary distillation column, the gas-bubbles, being compelled to escape from vertical surfaces, are very large. The perforated horizontal plate allows a great volume of gas to pass in bubbles of very small size, and thus assures the intimate contact of the whole stream of gas with the washing liquid.

It may be said that in a washer of this kind the absorption is inversely proportional to the cube of the diameter of the bubbles—1000 bubbles of 1 mm. diameter representing the same volume of gas as one bubble of 1 cm. diameter; but they offer a surface one hundred times greater. As the absorption takes place only on the outside of the bubbles, it will be seen that a washer-condenser which breaks up the gas into numberless small bubbles has a great advantage over apparatus in which the gas emerges from apertures of a larger size. In some cases such apertures may be 35 mm. in diameter, yet it is possible to make practical use of perforated plates in which the holes are less than 2 mm. in diameter—that is, breaking the gas into bubbles—1-260oth of the size.

The new washer-condenser to be used for the extraction of naphthalene is of cylindrical form. Each washing-tray is provided with a steam-coil to warm the oil, and with a discharge cock. The action of the apparatus is as follows: It is filled with oil at the start; and when the latter is found to be completely saturated with naphthalene in the lower chamber, it is discharged from tray No. 1 into No. 2, and that from No. 2 into No. 3; while the oil in No. 1 is replaced by a fresh supply. The weir overflow permits, however, of the excess of oil escaping, so that the pressure never exceeds 30 to 45 mm. The temperature is kept at from 25° to 35° C. as the solubility of the naphthalene in the oil increases considerably the temperature. In the case of works without steam-heating, the coil can be replaced by one of warm water produced by a syphon heated by the waste heat of the retort-benches.

The proposed apparatus has the great advantage as a naphthalene washer of requiring no motive power, and taking up but little horizontal space. It can thus be easily installed between the tar condenser and the ammonia washer. At N———, the washer has been used with anthracene; but in Germany it is possible to obtain other oils which are not procurable in France. Thus an oil of density 1·0950 contained before use 6·50 per cent. of naphthalene. In making mixtures of oil and naphthalene on the laboratory scale, the following results were obtained: 15 per cent. solution of naphthalene in oil gave a good deal of crystalline deposit at a temperature of 23° C. These crystals disappeared only at 28° C. The same oil with 20 per cent. of naphthalene became completely solid at 22° C., and pasty at 25° C. The percentages just quoted represent naphthalene in addition to that already present in the oil. These experiments show that, in practice, one can scarcely dissolve more than 13 to 15 per cent. of naphthalene. The proportion which can be removed from the gas depends on the quantity of naphthalene already in the oil, so that it is imperative to ascertain the amount of naphthalene in the fresh oil by the process described later.

Anthracene oil suffering from these defects, the authors investigated mixtures of hydrocarbons and higher alcohols obtained as residues from certain chemical works. They form an excellent solvent of naphthalene—taking up 25 per cent. at 25° C. On the other hand, working on the lines that there are mixtures of liquids which under certain conditions will dissolve more than each solvent separately, the author ascertained the best proportion to employ of their liquid with the oils produced from the distillation of coal tar, and were led to a mixture which is capable of dissolving 30 per cent. of naphthalene at 25° C. The naphthalene crystals do not appear until a temperature of 22° C. is reached in the case of a 30 per cent. solution, and in the case of one containing 20 per cent., not until a temperature of 15° C. is reached. This oil has the further advantage of being able to dissolve a small quantity of water.

In the case of anthracene oil, its deposition from water in consequence of a drop in temperature causes it to form an emulsion which considerably obstructs the washing. The oil described above has not this drawback. The following results were obtained: Although the temperature of washing could not be kept constant at 25° C., 340,000 cubic metres of gas were washed with 630 kilos. of the special oil, to which were added 150 litres of "Tonoir Gazine." This corresponds to a consumption of less than 2 kilos. of oil per 1000 cubic metres of gas—to be precise, 1·90 kilos. The naphthalene extracted amounts to 25 per cent. of the weight of the oil, or 48 gms. of naphthalene per 100 cubic metres. The suggested oil is much more fluid than anthracene oil, and also becomes less pasty. After use, its density is only 10° Beaumé (1·074), while with a fresh anthracene oil the density is 13° to 14° Beaumé (1·1000). The estimation of the naphthalen has been made by extraction with steam, according to a process described by M. Chevalet in 1884.

A vessel holding two litres is half-filled with ordinary water. Then 50 gms. of the oil to be examined are added; and the vessel is attached to a Liebig condenser of large size. The oil is gently boiled, and the naphthalene deposited from the water in the condenser. In order to decide the end of the operation, the flask in which the distillate is being collected is replaced by another, and a note is made as to whether there is any further deposit of naphthalene. In weighing the naphthalene, the distillate is poured through a double filter, dried over sulphuric acid, and weighed against a similar filter-paper on the other pan of the balance. In the case of a very small quantity of naphthalene, the latter can be more conveniently collected by shaking up the distillate with chloroform. The chloroform separates into a distinct layer, and is allowed to evaporate in a tarred flask; the residual naphthalene being weighed. The accuracy of this process has been confirmed by working on mixtures free from naphthalene, and on pure naphthalene.

In the above method, the naphthalene is distilled under a pressure equal to its vapour-tension at 100° C., and the boiling point of the mixture is half-a-degree below 100° C.—that is to say a difference corresponding exactly to the vapour-tension of naphthalene

at 100° C.—the vapour-tension of water at 99·5° C. being 746·5 mm. at a barometric pressure of 760 mm. The difference, 760—746·5=13·5 represents the vapour-tension of naphthalene at 100° C. It would be interesting to ascertain the vapour-tensions for temperatures below 100° C., but apparently liquids boiling at these lower temperatures and capable of dissolving naphthalene are not available.

Although the vaporization of naphthalene takes place in the case of coal gas approximately as in the above conditions, the presence of solvents of naphthalene in the gas—such as benzene, toluene, &c.—affect the action. But it is nevertheless a fact that the naphthalene can be completely vaporized at a low temperature by the passage of a current of air or gas. For this reason, it is well to draw attention to the part played by the hydraulic main in the production of naphthalene; the tar deposit in this part of the manufacturing system containing 10 per cent. by weight or 7 per cent. by volume of naphthalene. Much of the trouble due to naphthalene might be avoided if the hydraulic main was not allowed to get warmer than 45° to 50° C., and also if the gas emerging from the outlets was scrubbed in the tar. The sealing of the plungers should be in the water and not in the tar. M. Chevalet, in his experiments of 1884-7, has shown that tar is converted into pitch and the naphthalene in the tar removed either by the aid of steam at 100° C. or by passing a current of air or gas at a temperature of 55° to 65° C.—that is to say, at the normal temperature of the main. The higher this temperature, the more naphthalene is removed by the gas; and at the same time the lighter oils of the tar distil over—thus producing tars of less fluidity. This process may be pushed to a point at which the main is completely filled with pitch.

There is no difference between the action of a stream of gas and one of steam. The mass of the volatile body vaporized by the current is proportional to the vapour tension for the particular temperature of distillation, and to the volume of the vaporizing gas. As the vapour tension increases more rapidly than the temperature, the proportion of naphthalene vaporized increases very quickly. A main, therefore, in which the gas passes through the tar behaves as a retort in which the naphthalene is distilled. The portion of the system which follows the main plays the same part as the condensing coil of a retort. It is natural, therefore, that this should become gradually choked with naphthalene crystals. It is advisable, in the writers' experience, to control the temperature of the main and of the gas escaping from it each day by thermometers, reading from 40° to 65° C.; and care should be taken that the plungers dip into the water and not into the tar.

Working under these conditions, much less naphthalene will be produced, and at the same time tars obtained of greater value. As shown by M. Chevalet in 1887, thick tars contain a proportion of soot—as much as 25 per cent.; and a tar of this kind is considered of bad quality by the distillers, as the presence of the carbon makes it difficult to decide the separation of the water from the tar. Moreover, it deposits on the bottoms of the retorts—leading to outbreaks of fire. As the density of the tar increases in proportion to the content of carbon, a gas-works should take advantage of the readings of the Baumé hydrometer, and demand an extra price for tars of low density.

A certain quantity of naphthalene may be extracted when washing the gas with ammoniacal liquor. It was shown by the authors a year ago that the ammoniacal liquor contains in solution a notable proportion of naphthalene. This is due to the solubility of the naphthalene in the pyridine contained in the ammoniacal liquor. Pyridine might be employed in naphthalene washers if its price of 2 frs. per kilo. were not prohibitive.

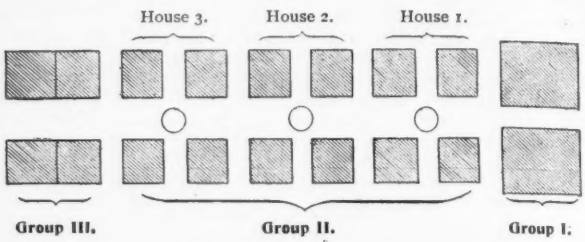
INFLUENCE OF THE REMOVAL OF CYANOGEN ON THE PURIFICATION OF GAS.

By M. Defoy.

[A Paper read before the Société Technique du Gaz.]

The extraction of cyanogen in the wet way by the methods of Rouland and Knublauch has been applied in several gas-works since the patent taken out by Dr. Bueb for the direct formation of an insoluble body—that is, the double ferrocyanide of iron and ammonium $(NH_4)2Fe{\cdot}Fe(CN)_6$—obtained by treating gas, still containing its ammonia, with a solution of sulphate of iron. This process was described by Dr. Bueb at the 1900 Congress, since when there has been the somewhat similar process of M. Guillet, communicated to the Congress in 1902 and 1903. M. Guillet showed from the theory of the process that its application was simple in practice, and might be worked at a small expense.

Apart from the lesser corrosion of gasholders, &c., due to the removal of cyanogen, the claims of MM. Bueb and Guillet as to the assistance rendered by their processes to the methods of purification may be confirmed. The efficiency of this latter operation may be thereby increased at least 50 per cent. There is no doubt whatever, that oxide of iron, natural or artificial, is usable for a much longer time if the gas is first of all deprived of its cyanogen—in fact, M. Perthuis, at the 1895 Congress, showed that cyanogen in certain circumstances can cause the purifiers to add impurities to the gas. These considerations have together provided a formidable array of facts in favour of the extraction of cyanogen before the entrance of the gas into the purifiers, and it seems beyond doubt that the effect is invariably favourable to the purification of the gas. Nevertheless, in certain somewhat special circumstances, the contrary must be stated. As will be shown, the assistance given to the purifiers by the removal of cyanogen, while it is considerable in most cases, is no longer possible when the purifying surface is very small and when the coals are highly rich in sulphur.



The works at X—— have three groups of purifiers arranged in the way shown in the drawing. The first group encloses purifiers already used, to which the gas is first admitted in order to absorb the ammonia which is still in the gas on its emergence from the scrubbers; the second group arranged in three houses each containing four purifiers, provides the purification proper; while, lastly, the third group makes good any possible deficiency of the others. In each of the houses of Group II. three purifiers are placed in series, while the fourth is kept out of action for revivification in the purifier by emptying. The gas is directed by the centre hydraulic valve. The revivification of the purifiers of the second group is made by introducing under the plates a mixture of air and steam. At regular intervals, the purifiers of the three houses are emptied, and then refilled with a new lot of material which has been revivified out of doors. In consequence of the development of the works, and of the exclusive use of English coal containing a good deal of sulphur, the purifying surface became, on a certain occasion, insufficient. This inconvenience was felt at the periods of maximum make, during which the gas could be purified with difficulty, in spite of frequent revivifications. The trouble experienced arose not only from the purification itself, but also from the repeated openings of the purifiers, twice each day, which gave annoyance in the neighbourhood. The first remedy suggested for this state of things was the substitution of the purifiers of Group II. by larger ones.

At this juncture, the experience of M. Guillet on the removal of cyanogen before purification came to the author's notice, and was confirmed by several German works making use of the Bueb system. Therefore it was decided to give a trial to this process of extracting cyanogen in the wet way, carrying the after-part of the method no further than the production of the mud. The Holmes washer includes five adjacent compartments for the removal of the cyanogen; communication from one to the other being by simple weirs. Three compartments separated from the first serve for the removal of the ammonia left after the absorption of the cyanogen. During the time of action of this washer, it was found that the cyanogen was removed without difficulty, and even at less expense for labour than stated by M. Guillet. In fact, the apparatus was kept in continuous use without further supervision than the control of the washing liquids and the emptying of the first compartment and the filling of the last. The solution of sulphate of iron was introduced as a thin stream into the fifth compartment from the outlet, and the mud flowed in an equal continuous stream from the first compartment on the side of the inlet of the gas.

A simple adjustment each morning of the sulphate of iron solution, based on the average quantity of cyanogen in the gas and on the number of furnaces at work, made it easy to obtain, during the make, a mud of quite normal composition. Unfortunately, the results from the point of view of purification were far from encouraging. It was found on revivifying the contents of the purifiers that their behaviour differed considerably from that usual before the installation of the washer, though every other condition was the same. The revivifying took place much more actively, even to the point of certain parts of the mass igniting and thus producing abnormal heating of the gas and defective purification. Contrary to expectation, the installation of the washer did not diminish the frequency of the revivification. It was then seen that the conditions under which the washer was installed—namely, over-worked purifiers and a highly sulphurous coal—could only be attended with the result above described. If any improvement at all was to be derived from the washer, it would be for practical purposes an increased life for the material of the purifiers, so that one and not two revivifications per day would be necessary. Such a benefit was evidently obtained in French and German works, but in the X—— works, with English coal, the conditions were somewhat different. The production of cyanogen was greater with English coal than with French and German, which contained less nitrogen.

Dr. Bueb, in his 1900 address, stated that cyanogen estimated as yellow potassium ferrocyanide—$K_4Fe(CN)_6{\cdot}3H_2O$—varies from 3·5 to 8 gms. per cubic metre of gas. The lower figure applies to coals from Eastern and Northern France, and the latter to that from England. The sulphuretted hydrogen increases in about the same way; the normal figure for the French coals

being 5 to 6 gms. of sulphur per cubic metre of gas as found by M. Guillet at Besançon. The English coals used at X—— contained on the average 20 gms. and often 25 gms. of sulphur per cubic metre. Thus, in the case of the gas referred to by M. Guillet, the cyanogen, expressed as yellow cyanide, amounts to three-quarters the total sulphur, whereas in the X—— gas from English coal the cyanogen—again as yellow cyanide—is one-third the sulphur. Thus, if with the French coals it is possible to obtain a 50 per cent. advantage in purification by the aid of the washer, it is useless to expect an equally good result when we are working from English coal. The advantage of the washer is still further discounted in the case of this latter coal when it is remembered that the scrubbers had to be thrown out of action, as explained later.

It will thus be seen that the character of the X—— coal and the increase in the activity of the purifying material led to the failure. The basis of the Bueb and Guillet processes being the elimination of the cyanogen by the ammonia in the gas, the chief condition to be observed for the complete removal of the cyanogen is to retain in the gas on its entrance into the washer enough ammonia to form not only to insoluble ferrocyanide of iron and ammonia which constitutes the cyanide mud, but the soluble ferrocyanide of ammonium which is afterwards treated. The ratio $\left(\frac{\text{ammonia}}{\text{yellow cyanide}}\right)$ is about 0·7 in the case of properly-saturated mud; but in order to reach this result, and to be certain of absorbing the whole of the cyanogen, we had to throw the scrubbers out of action, and even in some cases—not very many, it must be admitted—to reduce the action of the cooler placed before the extractor.

As already stated, it was found that to retain the proper quantity of ammonia in the gas the scrubbers had to be dispensed with. Yet when this was done, it was found that the removal of sulphur and other impurities from the gas suffered. It was also found that the washer absorbed quantities of sulphur from the gas —amounting to 3·2 gms., 1·71 gms., or 1·92 gms. per cubic metre; whereas the scrubbers on different days would be taking from the gas 1·6, 5·01, or 4·72 gms.—thus showing that if both scrubber and washer could not be used together, the purity of the gas might suffer. Also, it should be added, the removal of the scrubbers left in the gas a certain quantity of carbonic acid not completely eliminated by the washer.

The above record of experience should not be interpreted as reflecting in any way upon the processes of Dr. Bueb and M. Guillet. It is, on the contrary, the author's opinion that the extraction of cyanogen in the wet state according to their methods is a distinct advance in the manufacture of gas, and that the gas companies and works must, as a rule, benefit from the advantages which they afford. The author's object has been to instance the dilemma in which a gas maker taking up the process may find himself when compelled to work under certain conditions.

Appendix.

Determination of the Sulphur Retained by the Washer.

On the assumption that the washer passes 10,000 cubic metres of gas from English coal containing at the inlet the following:—

Cyanogen . . 6·8 gms. per cubic metre (reckoned as potassium ferrocyanide $K_4, Fe(CN)_6 \cdot 3H_2O$.

Ammonia . . 4·1 gms. per cubic metre of NH_3

then the total quantity of (yellow) ferrocyanide in the water is

$$10{,}000 \times \cdot0068 = 68 \text{ kilos},$$

and the total quantity of ammonia is

$$10{,}000 \times \cdot0041 = 41 \text{ kilos}.$$

According to M. Guillet, the reactions in the washer are:

(1) $\underset{152}{Fe\,SO_4} + \underset{68}{(NH_4)_2\,S} = \underset{88}{Fe\,S} + \underset{132.}{(NH_4)_2\,SO_4}$

(2) $\underset{88}{Fe\,S} + \underset{88}{2(NH_4)\,CN} = \underset{108}{Fe\,(CN)_2} + \underset{68.}{(NH_4)_2\,S}$

(3) $\underset{108}{Fe\,(CN)_2} + \underset{88}{4\,NH_4\,CN} = \underset{284.}{(NH_4)_4\,Fe\,(CN)_6}$

(4) $\underset{284}{(NH)_4\,Fe(CN)_6} + \underset{88}{Fe\,S} = \underset{304}{(NH_4)_2\,Fe{\cdot}Fe\,(CN)_6} + \underset{68.}{(NH_4)_2\,S}$

(5) $(NH_4)_2\,Fe{\cdot}Fe(CN)_6 + (NH_4)_2\,S = (NH_4)_4\,Fe(CN)_6 + Fe\,S.$

The cyanogen of the 68 kilos. of yellow cyanide comes from the gas only in the form of ammonium cyanide according to reactions (2) and (3); the quantity of ammonia in this ammonium cyanide is:

$$\frac{(6 \times 17) \times 68}{422} = 16{\cdot}4 \text{ kilos}.$$

The total quantity of ammonia available in the apparatus is, as we have seen, 41 kilos. Therefore $41 - 16{\cdot}4$ ($= 24{\cdot}6$) is retained in a form other than cyanide. Assuming this ammonia to be present as sulph-hydrate, $(NH_4)_2S$, the quantity corresponds to 23·1 kilos. of sulphur removed from 10,000 cubic metres of gas (say) 2·31 gms. per cubic metre—that is to say, theoretically the washer retains 2·3 gms. of sulphur per cubic metre.

Mr. Benjamin H. Thwaite, whose death was recorded in the "JOURNAL" for May 12 last, left estate valued at £1076 gross.

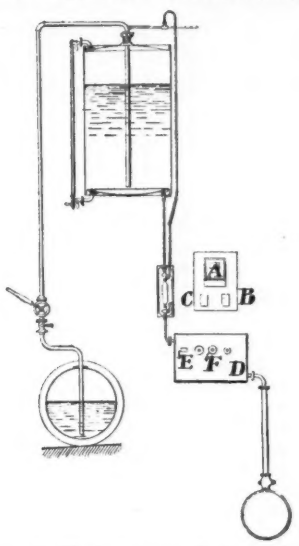
ELECTRICAL APPARATUS FOR CARBURETTING GAS BY BENZOL.

By M. MÉTIVIER.

[A Paper read before the Société Technique du Gaz.]

In describing an electrical installation for the enrichment of coal gas by means of benzol, the author points out the advantages of such a system in regard to the absence of a fire in the neighbourhood of the carburetter—thus obviating, to a great extent, the risk of explosions.

The installation (as shown in the drawing) consists of a reservoir for the storage of benzol. This is filled by a hand-pump, which draws the liquid from the tank in which it is delivered. A level indicates the amount of liquid in hand. The consumption of the benzol is indicated or controlled exactly by the cocks



A. Electric meter. B. Bipolar cut-out. C. Contact breaker. D. Case for vaporizer tube. E. Electrical contacts. F. Switches.

shown on the left-hand of the tank. The benzol falls into a graduated cylindrical chamber, which serves the double purpose of measuring the amount used and of insuring the proper cooling of the liquid. It afterwards passes into the vaporizer. That shown in the drawing consists of a tube, coiled five times, through which the liquid trickles. The metallic resistances are arranged around this tube and form a series of circuits, all or part of which may be employed according to the quantity of liquid to be vaporized. The whole vaporizer is enclosed in a chamber made of non-conducting material. On the front are placed the electrical terminals and the switches for the different circuits.

The apparatus shown is one measuring 90 by 70 by 25 c.m., and includes five circuits, each of 3·5 amperes. It is capable of vaporizing 10 litres of benzol per hour. According to the results obtained, the current used amounts to about 480 watts per litre of benzol vaporized at the temperature of 125° C.; the surrounding chamber being 15° C. The apparatus can be readily adapted to work with existing plant, and may be arranged for use automatically or otherwise. One similar to that here described has, it is said, been in use for more than eight months, with complete satisfaction.

HISTORY OF PHOTOMETRIC STANDARDS.

By F. N. MORTON.

[A Paper read before the Philadelphia Section of the Illuminating Engineering Society, U.S.A.]

(*Continued from p.* 853.)

Ether-Benzene and Alcohol-Benzene.

Crookes's Standard.—Probably the earliest standard of this type was that of Crookes, described in the "American Gas Light Journal" for 1876.* He used a lamp whose wick was made up of a number of platinum wires of a certain size. The fuel was a mixture of pure alcohol and benzene. The light was claimed to be much more constant than that of the candle, but was too feeble for the lamp to be of practical value.

Blondel's Standard.—This also consisted of a lamp in which the upper part of the wick tube is surrounded by a cap pierced with a hole at the top. The flame is surrounded by a chimney, dead-black inside, and with two glass covered windows oblique to each other, one to allow the light to pass through, and the other for purposes of adjustment.

Dutch Committee's Standard.—The Dutch Committee on Photometry in 1894 proposed the use of a modified Harcourt's one-

* See "JOURNAL," May 2, 1876, p. 658.

candle wick pentane lamp as a standard, but with another fuel. Ether alone was found to be too sluggish in passing up the wick; but after mixing with benzene, it was found that the variation in light intensity was only 0·1 per cent. for mixtures of from 8·5 to 10·2 parts of benzene to 100 of ether. The mixture selected was 9 parts of benzene to 100 parts of ether. Tests showed that the materials did not have to be absolutely pure, and that one did not burn faster than the other. The lamp closely resembles the one-candle pentane. The upper part consists of a cylindrical metal chimney with two rectangular openings opposite each other. The upper part of the lamp is warmed for half-an-hour by being placed over a gas-jet, after which it is transferred to the reservoir, when its warmth at once causes the fluid to evaporate at approximately the required rate; finer adjustments being made by regulating the wick. The standard is equal to 1·48 English candles. The mean deviation was 2·87 per cent.; the extremes being − 9·82 per cent. and − 0·02 per cent. Two lamps compared with each other gave a mean deviation of + 0·62 per cent.

Wartha's Ether Standard.

This was brought out in 1874, and consisted of a tank, similar to those used for carbonic acid, placed in a vessel of water. When it was desired to make a test, the water was heated, causing the ether to evaporate, when the vapour, passing through a micrometer cock to a burner of known size, burned with a brilliant white flame. This is another standard which, never having been used to any extent, never seems to have excited any controversy.

Acetylene Standards.

Violle's Standards.—About 1895, Violle suggested the use of a perforated screen placed before an acetylene flame; and about a year later he brought out a standard consisting of a lamp with a small conical orifice from which the gas issued, drawing in the required air. The whole resembled the ordinary laboratory bunsen burner. The mixing-tube ended in a steatite batswing burner. Either the whole flame or a part might be used. In the model employed, the flame was enclosed in a small box, one side of which was provided with an iris diaphragm, enabling any desired number of candles to be secured, and another side was furnished with a revolving plate containing openings of different sizes, each of which had been carefully calibrated.

Greville's Standard.—In 1895, H. Leicester Greville suggested using an argand burner with very fine holes; the height of the flame being adjusted. Only a definite portion of the flame was used.

Fessenden's Standard.—In a communication to the American Institute of Electrical Engineers in 1896, Professor R. A. Fessenden wrote that he had tried to make a slit burner with adjustable edges, with a view to providing a standard. He found, however, that the expansion of the materials with heat introduced appreciable errors. He then tried two small circular jets impinging on each other at an angle of 90°, which, he claimed, formed an even, luminous flame, only slightly affected by draughts and other atmospheric conditions. This standard, however, never seems to have been adopted or used by anyone but the inventor.

Féry's Standard.—Charles Féry first suggested using a bit of thermometer tube with a bore of 0·5 mm. as a jet for the acetylene. He found that the luminous intensity was proportional to the flame height between the limits of 1 and 2·5 cm. In 1904, he modified this primitive affair by placing the flame behind a diaphragm pierced with a hole of given size opposite the region of maximum brilliancy. The flame is focussed upon the screen by a lens; and the screen is divided in a scale admitting of the exact regulation of the flame. The device also has the advantage of suppressing the penumbra surrounding the cone of rays crossing each other on the diaphragm. A lens in the screen itself projects the rays from the standard to the photometer disc.

In general, the difficulty with acetylene is that it is so rich that it has to be diluted with air; and, on account of the explosiveness of the mixture, the orifice has to be so small that accuracy of workmanship cannot be guaranteed. The hole, moreover, is subject to clogging with carbon, altering the proportion of the mixture. Sharp has burned acetylene in a mantle of oxygen; but the flame is so sensitive to pressure changes as to make it unserviceable. Hartmann used mixtures of acetylene and hydrogen, and found that the intensity was at a maximum with a half-and-half mixture.

Welsbach Mantle.

The Welsbach mantle was suggested as a photometric standard. Tests made in this connection at Cornell University showed a rapid fall in luminosity for the first 200 hours, after which the decline was very slow and almost uniform. It was suggested that mantle burners might make satisfactory standards by properly aging; but nothing has as yet been made public to indicate any progress in this direction.

Oxide of Calcium.

E. L. Nichols measured, by means of a thermopile, the intensity of radiation from the lime light brought to incandescence by an oxyhydrogen flame, and found a rapid and continued falling off throughout the test. This result confirmed earlier photometric tests. Discs of magnesium oxide and zircon showed analogous behaviour, though there seemed to be reason to believe that the decrease was less rapid than with lime.

Illuminating Gas Standards.

Giroud Combination Standard.—While this was not the earliest standard in which the same gas was burned as was to be tested, being brought out in 1882, yet it never came into practical use, and so may be disposed of first. It consists of an open argand gas-burner with a glass chimney. Since variations in the flame of the burner cannot be readily discerned in the flame itself, an indicator is provided in the form of a single jet 1 mm. in diameter, and giving a light equal to one-tenth of the other. The height of the indicating jet is gauged by sighting through a perforated screen. An increase in richness of the gas will be accompanied by an increase in the size of the two gas-jets (since they are connected to the same source of supply), which is slight in the argand and marked in the jet. The main supply to the two jets is then throttled until the pilot-jet is at the standard height, when the argand will be at its normal point. The standard equals one carcel or ten candles as desired. Heisch and Hartley made some tests, finding the mean deviation about 2·5 per cent. They think that, in ordinary practice and with a better arranged sight-device, the errors should not exceed 3 per cent.

Methven Screen.—In 1878, John Methven read a paper before the British Association of Gas Managers, in which he announced that, when gas was burned in similar argand burners at a given height of flame, there was a region in the flame which would, for equal areas, give equal illuminating powers for gases rated at between 15 and 35 candle power. He had determined the illuminating value of horizontal zones of the flame ¼-inch wide, but found a lack of uniformity due to alterations in the width of the flame, and to variations in brightness at the edges of the flame. He, therefore, adopted as a screen a plate with a hole, 1 inch high by ¼ inch wide, immediately opposite the brightest portions of the flame, which allowed a light to pass equal to 2 caldes.

The report to the Board of Trade "Committee on Photometric Standards" in 1881, however, while admitting the simplicity and convenience of this standard, reported that its utility was limited to gas which did not vary by more than 2 candles. The report of the Photometric Committee of the German Association of Gas Managers in 1880 was not even as favourable as this—stating that it was more liable to variation than the candle. On the other hand, F. W. Hartley, who at first was loud in condemnation of the Methven screen, recanted in a paper read before the British Association of Gas Managers in 1880, and said that his own experiments showed close agreement with gases ranging from rich cannel of 35-candle power to unenriched gas of 14 candles.

While still expressing faith in this other system, in 1882 Methven suggested carburetting the gas to be used in his standard by passing the gas over trays of very fine gauze through which some hydrocarbon (pentane or gasolene) dropped from one to the other. With this system, he used a 2½-inch flame, instead of a 3-inch as before, and also slightly reduced the size of the aperture in the screen. This change abated somewhat the war of criticism, and approval waged among the enemies of the standard and those in favour of it. Dibdin, for instance, as a result of a series of tests, said that its inaccuracies must militate seriously against its adoption with plain gas; but with carburetted gas it was capable of good work. In another report, however, he says that observations by different operators could not be considered satisfactory, as more experience was required with the carburetted gas than would appear necessary. In the same report he found a maximum deviation of 5 per cent. Heisch and Hartley found no difference whatever when gas rated at from 13·65 to 22·4 candles was used; while Rawson and Grafton, on the other hand, said that, in over 2500 tests, the average difference was only 0·31 candle in the gas; and a comparison of 14,600 tests at Beckton with 3670 tests by the examiners showed the candle powers to be 16·52 and 16·58 respectively. He then says that with mixtures of 16 or 17 candle coal gas and 20 or 21 candle water-gas, there is no serious change until the percentage of water-gas exceeds 14. He also recommends the standard for uniformity, for ease of adjustment, and for general reliability.

In its present form, it consists of a Sugg argand burner with a flat or concentric screen 1½ inches in front of the centre of the burner. This screen carries a slide in which are two vertical rectangular openings, adjusted to pass a light of 2 candles for the 3-inch and 2½-inch flames respectively. The openings are 1 inch by 0·233 inch and 0·31 inch by 0·585 inch, and are cut in silver so that the standard shall not change through corrosion.

This standard has come into very extensive use in England, and has been used more or less in America, although here the Edgerton has largely covered the field. A modification of this lamp was proposed by W. W. Fiddes, who used, instead of a flat screen, a brass chimney with an opening ⅜-inch in diameter opposite the flame. This, according to the author's experiments, gave a constant light of one candle. Nothing was ever done further, however.

Edgerton (or Mobile) Standard.—This standard was exhibited by H. H. Edgerton at the meeting of the American Gaslight Association in 1875. It consists of an argand burner with a brass sleeve surrounding the chimney. This sleeve has a narrow horizontal opening extending across it, so as to take in the full width of the flame, and a small part of its height. The entire affair is what Methven tried three years later and abandoned in favour of the vertical slot. Since then the back of the sleeve has been cut away, to avoid reflecting; and little windows have been provided in its sides, to facilitate the regulating of the flame. The illumination is about 6 candles. In 1895, Professor D. S.

Jacobus found by experiment that the light centre of the standard was nine-tenths of an inch in front of the geometrical centre, and entirely outside of the flame itself.

Probably owing to the fact that gas men in America, where the Edgerton standard had come into very extensive use, are not so apt to make public their investigations as are their English cousins, not much has been published as to the merits of this standard. Mr. Rollin Norris, however, conducted experiments which showed that with water gas it was extremely unreliable, giving variations as high as 4·2 per cent. above and 6·7 per cent. below the average. With coal gas, he found it somewhat more constant. On the other hand, Mr. A. S. Miller reported to the American Gaslight Association in 1900 that, in a long series of experiments under different conditions, the extreme variation in tests that should be alike was 2·5 per cent.; and the tests, in general, seemed to indicate that it is highly satisfactory, provided it is not disturbed after being standardized.

With the Edgerton sleeve, frequent standardizations are necessary, either with candles, pentane, Hefner, or some other form of standard.

Sugg's Ten-Candle Standard.—This consists of an argand gas-burner giving a flame regulated to a height of 3 inches. The top of the flame is cut off by a screen which reduces the height of the light to 1¾ inches. The standard is mounted on a meter which registers the amount of gas consumed, and constitutes an indication of the highest value of the variations of the flame.

Kerosene Lamps.

Numerous attempts have been made to use kerosene lamps as photometric standards. In 1884, Frederic Egner reported, as the result of some tests, that the light was remarkably uniform. Heim used an oil-lamp as a secondary standard with good results. Von Hefner-Alteneck said it was superior to the carcel, and Dr. Clayton H. Sharp used a kerosene lamp with an argand burner, the top of the flame being screened off by a ferro-type iron cylinder fitting close to the chimney. This lamp furnished a very steady source of light; and the intensity was unaffected by slight variations in the height of the flame. Its intensity changed, however, from day to day; and the lamp had to be standardized daily.

Lecomte and Luchaire's Lamp.—This lamp, which uses a variety of kerosene known as "Stella" oil, comprises a reservoir surmounted by a burner using a wick. Surrounding the chimney is a blackened copper box with windows for observing the flame, and an opening partly covered by an adjustable diaphragm to cut down the light to 10-candle power. The lamp is mounted on a balance, and correction is made for consumption of oil in a manner similar to the correction for irregular burning of candles. This is another standard which apparently has never made its appearance outside the laboratory.

Elliott Kerosene Lamp.—This is of the student lamp form, with a flat cotton wick 1½ inches wide.* To prevent smoky tails, the wick is clipped off slanting at the corners. The chimney is the usual No. 40 Macbeth pearl glass. An adjustable brass screen covering the upper part of the flame is supported upon two upright brass strips riveted to the burner shell. The inventor claims that his lamp is simpler and more reliable than the pentane lamp, and experiments made by him gave good results. Tests were also made at the Electrical Testing Laboratory in New York; but these are inconclusive as published, since, while they give the temperature, no mention whatever is made of the other atmospheric conditions. Other tests made at the National Physical Laboratory, London, show a variation of from 10·23 to 9·26 candles, the humidity dropping from 13 to 11·7 litres per cubic metre. The report states that the experimenters think that the evidence is not sufficient to attribute any change there may have been in candle-power to variation in humidity.

Incandescent Electric Lamps.

Incandescent Platinum Wires.—In 1857, Zoellner experimented with incandescent platinum wires for the purpose of studying the radiations from them; but no reliable results were derived. In 1878, Schwendler revived the plan; but the method was never adopted, owing to variations in the emissive power of the surface of the strip and alterations in its cross-section. In this connection, though it is not an electric lamp, it might be of interest to mention a scheme suggested in 1866 by W. W. Fiddes. He proposed to heat a loop of platinum wire in the flame of a bunsen burner, to which just enough air was admitted to remove the luminosity. He said that the incandescence of the wire immersed in the flame would be invariable for every variety of gas in ordinary use.

Carbon Incandescent Lamp.—Many attempts have been made to obtain a primary standard of light from the incandescent electric lamp; but all these failed through lack of constant relation between illuminating power and physical conditions. It has, however, done good work as a secondary standard. In 1884, Preece used what would now be called an illuminometer in which the standard was a 2·5-candle power Swan electric lamp. The current was regulated until the illuminations were equal; and the candle power was then read. Photometricians (mostly of the electrical persuasion, however) seem to agree that in the incandescent electric lamp a satisfactory standard has been found, even if it is only a secondary one. The filament should be in the form of a single loop lying in one plane which is in the axial line of the lamp. The lamp should be aged by running for 50 hours slightly above its normal voltage; and after that, in practice, taking care that the normal voltage is not exceeded. Dr. Fleming recommends, before using the lamp as a standard, taking the filament from the original bulb and putting it in a larger one—thereby reducing blackening of the bulb. Messrs. Good and Wilde, however, believe that a large bulb is of little value. Tests made by Mr. C. C. Paterson showed that there is no doubt that high-voltage lamps that will remain constant in candle power for a considerable time can be obtained, but that they cannot as yet be produced with certainty. A lamp should be standardized at the end of each twenty hours' running.

Osmium Lamp.—This has, of course, still to be developed. Revessi found that with constant current the candle power first increases—reading 103 per cent. of the original after 200 or 250 hours, then slowly decreases to 97·6 per cent. after 800 hours, and 96·6 per cent. after 1680 hours. At constant voltage, the candle power increases to 106·7 per cent., and then decreases to 98·2 per cent. and 93·2 per cent.—the hours corresponding to those in the preceding case. Hence it is better to use constant current with this lamp.

Bowditch's Naphthalene.

In his book on "Coal-Gas," published in 1867, the Rev. Thomas Bowditch suggests a standard, and shows a touching confidence in it. He says: "If a Government Commission were appointed to examine the whole question of a light measure, I have no doubt that it would adopt the one I now proceed to describe, and would publish such directions as would render error impossible, except to the culpably careless, or the wilfully wrong-doing." Then the author says that he would suggest using either pure carbonic oxide or else hydrogen—passing it at a definite rate through a carburetter containing pure naphthalene, and burning the product. The carburetter containing the naphthalene was to be weighed before and after the test, to make sure that the proper quantity was consumed. "The materials used would be invariable, and thus the errors arising from manufacture and personal manipulation would be prevented."

(*To be continued.*)

* This lamp was illustrated in the "JOURNAL" for May 29, 1906, p. 578.

REGISTER OF PATENTS.

Manufacture of Coal Gas.

Franks, E. A., of Ferndale, Glamorganshire.

No. 16,303; July 16, 1907.

The patentee claims to have discovered, as a result of experiments, that if a certain proportion of steam coal or coal other than gas coal is added to gas coal and thoroughly mixed with it before the mixture is introduced into the retort, the amount of coal gas given off during distillation is greatly in excess of that which would be produced by the distillation of the gas coal alone, or of the sum of the yields which would be produced from the gas coal and steam coal if they were distilled in separate retorts.

He describes, as an example, one way in which the invention may be carried out—the added substance being steam coal capable of yielding 3000 cubic feet of coal gas to the ton; and the gas coal used being such as will yield under ordinary conditions of distillation 10,000 cubic feet to the ton. Under these circumstances, he says he has found that a vastly increased yield of gas is obtained if the steam and gas coals are mixed in the proportions of three and four respectively. "The yields of gas that might be expected to result if three tons of such steam coal and four tons of such gas coal were separately distilled would be (say) 9000 cubic feet and 40,000 cubic feet of gas respectively; while if the two coals are thoroughly mixed and distilled together, the yield of gas would be over 70,000 cubic feet.

The proportion of steam coal or coal other than gas coal will, he says, depend upon the particular circumstances of each case. In the above example, the proportions mentioned have been found to give the best results; an increase in the proportion of steam coal—say, by mixing together four tons of steam coal and four tons of gas coal—"causing no marked increase in the production of gas."

The patentee says he is aware that it has been proposed (in John Armstrong's patent No. 1642 of 1906), for the purpose of producing coke of an improved quality, to use coal or soft coke, such as gas coke, or steam or anthracite or other coal, or a mixture of them; such materials being reduced to a fine powder and distilled in a furnace, oven, or retort; and he makes no claim to such invention. But what he claims is: "In the manufacture of coal gas the use with ordinary gas coal of steam coal or coal other than gas coal, said additional coal being mixed with the gas coal and the mixture distilled in ordinary gas-retorts."

Water-Gas Apparatus.

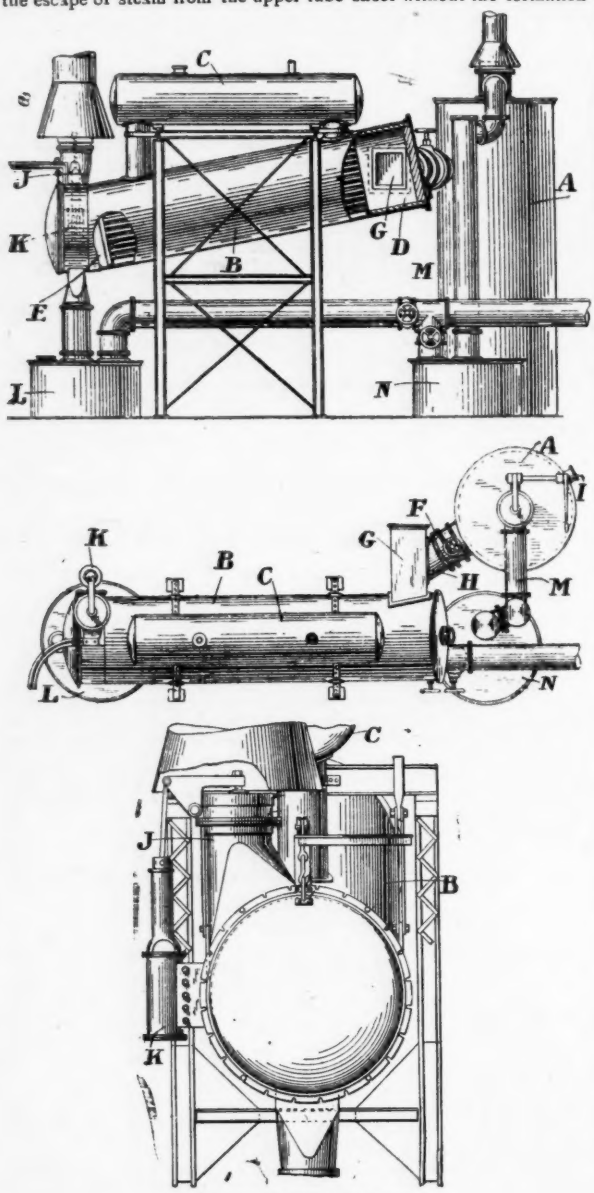
Boult, A. J.; a communication from J. H. Taussig, of Philadelphia, U.S.A.

No. 25,036; Nov. 12, 1907.

The objects of the present invention are to provide apparatus by means of which, while the heat of the water gas and blast products may be practically utilized for generating steam, means are provided for passing either the blast products or illuminating gases (or both) through the boiler, as well as for cutting out the boiler so that the gas-making operation need not be interrupted when the boiler is not used. The invention is applicable for use either in connection with

carburetted water gas apparatus or with blue or uncarburetted water gas plants.

A is the chamber from which the water gas and blast products leave the apparatus—commonly called a fixing-chamber. It is cylindrical; and the gases leave it at its top, by connections through its generally flat top. A rectangular framework of lattice uprights supports the boiler B in proximity with the top of the fixing-chamber, and in such a way as to allow for the necessary expansion and contraction. By arranging the boiler at an inclination, it may be conveniently cleaned when necessary for removing any deposits. The inlet end is higher than the outlet, in order that the blast products or illuminating gas, or both, pass through the tubes from the higher to the lower end, so that the tarry deposits from the gas flow to the cooler lower end and do not fall back to the hot part where they would be baked. The boiler is provided with a steam drum C, so that the shell can be filled with tubes and afford a large heating surface for the diameter of shell. The tubes are completely immersed in water to prevent their becoming burnt by the incoming gas. The inclination of the boiler permits of the escape of steam from the upper tube sheet without the formation



Taussig's Water-Gas Plant.

of steam pockets, which, if present, might lead to the burning of the ends of the tubes. At the right-hand or high end of the boiler there is a chamber D lined with fire-brick (the combustion chamber), and at the left-hand or low end is a smoke-box E.

The construction of the passage F and fire-box enables them to properly play their parts in "providing a commercially operative apparatus." This passage is shown to consist of a portion G, of generally rectangular cross-section and provided with a hole by means of which it can be cleaned, or which may be employed for the introduction of secondary air for the purpose of burning the blast products. This passage also consists of a branch H, which is made with a removable wedge-like section, so that it can be readily removed and a section employed which is solid when it is desired to close the passage, as, for instance, during repairs. A water-cooled valve is arranged in the branch. The air inlet I is arranged through the wall of the fixing-chamber near its top; as by introducing the air to the blast products prior to their entry into the boiler, the air and blast products have time to become thoroughly mixed and burn before becoming chilled by the boiler.

The smoke-box E is provided with an off-take J, which leads to the stack, and is provided with a valve operated by means of a hydraulic cylinder K. The smoke-box also has communication with the hydraulic seal-box off-take L. M is the gas off-take by which the illuminating gas may be led from the fixing-chamber to the hydraulic seal-box N, without traversing the boiler.

During the blow, the blast products from the fixing-chamber A pass through the boiler, which absorbs their heat, and they escape by way of the off-take J and stack. During the run, the water-gas traverses the boiler, to which it imparts its sensible heat; and thereupon the water gas reaches the hydraulic seal-box L, and thence may be led away for use. If it be not desired to pass the illuminating gas through the boiler, it flows by the pipe M to the hydraulic seal-box N, and thence to the relief holder. It is possible to connect more than one set of water-gas apparatus with the part G, so that the gas from them may be utilized for heating the boiler.

When applied to a blue or uncarburetted water-gas plant, in which no fixing-chambers are used, the steam generator would be connected directly to the gas generator.

Vertical Gas-Retorts.

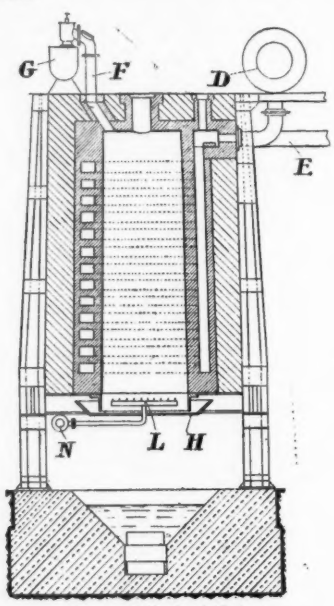
KOPPERS, H., of Essen, Germany.

No. 26,057; Nov. 25, 1907.

This invention relates to retorts in which the gas is led back "for the purpose of removing the gaseous distillation products, and thus prevent them stopping the passages." It consists essentially in the application of this known principle to vertical retorts.

The patentee mentions that in vertical gas-retorts a space always exists between the bottom of the retort and the part which is right in the fire "which is not sufficiently heated to effect proper distillation of the material to be coked"—a space filled with an indifferent matter, "for which purpose sand, ashes, or coke, or some solid body may be employed."

Part of the gas obtained, after being cooled and separated from all bye-products, is allowed to flow to this dead space, which is constantly scoured through and at the same time kept cool, so that the formation of precipitates in consequence of decomposition is avoided. Burning hard of the filling material or the filling body is made impossible by the constant supply of gas, which does not permit the lower parts becoming excessively hot. This action enables a water-pan or the like to be used as a bottom closure for the retort, as the formation of precipitates is avoided.



Koppers' Vertical Retort.

The vertical retort shown, which is fed with fresh material through its upper opening, is surrounded its full height by heating flues supplied with gas from the conduit D; the combustion products being conducted away through E. The distillation gases leave the retort by the tube F, and are collected in G. The bottom of the retort is formed by the water-pan H, into which the retort dips. The retort is supported by a frame in such a manner that it is accessible from below. Immediately over the pan H is a distribution device L for the returning gases, provided with perforations distributed over the whole surface, and connected to the gas-conduit N by a pipe.

In order to set the retort in action, as much coke is filled into it as will allow the material to be distilled to be within the heating range when placed on top of the coke. During the whole time of distillation, gas obtained from a previous action intrudes by the conduit N through the filling material and keeps the free spaces in it constantly filled while rising to the upper part of the retort, where it mixes with the freshly produced gas and leaves the retort with same. The retort is emptied after the pan H has been removed.

Pipe-Joints.

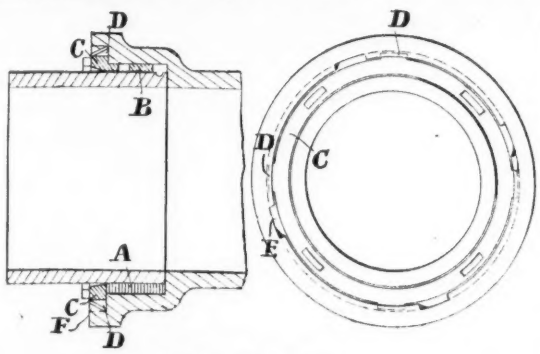
DEUTSCHES GUSSRÖHREN SYNDIKAT-AKTIENGESELLSCHAFT, of Cologne.

No. 26,825; Dec. 4, 1907. Date claimed under International Convention, Dec. 4, 1906.

In the usual spigot and socket joints with packing for gas and water pipes subjected to high internal pressure, or to distortion by sinking of

the soil in which the pipes are laid, the patentees point out that the packing is liable to be blown out or displaced, and the junction between the lengths of pipe to become thereby loosened, "great damage being often caused by the escape of gas or water from the pipes." It has been attempted to remedy this disadvantage by a flange connection in which a cover is drawn by screws against the open end of the socket, so as to prevent the packing from coming out; but "the connecting screws used in this arrangement have the disadvantages that they considerably increase the cost of the packing, and render the work in the trench difficult, and that, despite the rusting of the bolts, loosening of the packing is still possible, while such rusting renders it impossible to take apart the connection without destroying it."

This invention is applicable to rigid connection by lead and to yieldable connections by flexible packing rings; the "arrangement, without the assistance of screws, ensuring that the packing used will always remain in proper position, while the jointing, and also unjointing, can be effected with ease and certainty in the trench."



A German Pipe-Joint.

The illustration shows a longitudinal section of the socket and spigot ends of two adjacent pipes connected with each other according to this invention; the lower joint representing one made by rigid lead packing, while the upper one represents a joint made by (say) rubber.

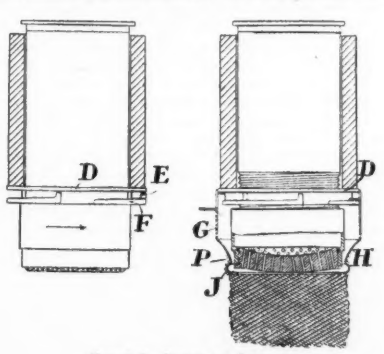
The packing of the socket end of one pipe against the spigot end of the other pipe is effected in the usual manner by the insertion of a lead packing A or of a rubber or other flexible ring B. The closure of the joint, and the securing of the packing in it, is effected by a ring C of suitable material inserted in the socket end and held therein so as to allow of its ready insertion and removal. For example, the ring can be secured, after the manner of a bayonet-joint, by providing it with projecting parts such as D; suitable recesses E being made in an undercut part at the end of the socket, so that the ring can be introduced by passing the projecting parts through these recesses into the socket and turning the ring so that the projecting parts pass into the undercut part F at the end of the socket. The ring is held in place thereby.

Inverted Incandescent Burners.

GRAETZ, M., of Berlin.

No. 793; Jan. 13, 1908.

This invention relates especially to inverted incandescent burners used with pressure gas. It is usually (for the purpose of causing all the burning gases to pass through the meshes of the mantle) proposed to arrange for the mantle-carrier to tighten against a packing or against the burner-head; it has also been proposed to provide burner-heads for inverted lamps with holes inclined outwardly. "In order to get an efficient and even illumination of the mantle," the present patentee provides these two means in combination "in a simple and efficient form."



Graetz's Inverted Burner.

The illustration shows such a burner without the mantle-carrier; also with the mantle-carrier in position.

Gas under pressure enters by a nozzle above, and its passage through the burner-tube draws with it air through openings provided with the usual regulating means. On the bottom of the burner-tube is fixed a ring D, having a bayonet joint E, the surface F of which is inclined upwards. The mantle-carrier consists of a cylindrical body G provided with an inwardly projecting part H and a flange J at its lower end adapted to be moved up against the end of the burner-tube when the mantle-carrier is in position. The upper end of the mantle-carrier is provided with lugs, which pass through openings in the bayonet joint on the lower end of the burner-tube. By turning the mantle-carrier in the direction of the arrow, the lugs rise after the manner of a screw on the inclined face F of the bayonet joint; and in this way the flange J on the lower end of the mantle-carrier is pressed against the end of the burner-tube so as to effect an air-tight connection between the mantle-carrier and the burner-tube. By this construction, all the gases passing from the burner-tube must find their outlet through the meshes of the mantle.

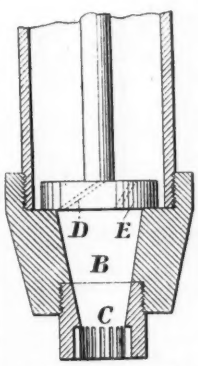
According to the second form shown, instead of the ring D being fixed to the end of the burner-tube, it is adapted to be screwed on it; and the bayonet joint connection is not provided with any sloping surface, such as F. The mantle-carrier is here placed on the ring D in the usual manner, and the ring is screwed on the end of the burner-tube until the flange J of the mantle-carrier lies air-tight against the end of the burner-tube. At the bottom of the burner-tube is a plate P (forming a burner-head) of steatite, with holes in it inclined downwardly and outwardly, so as to direct the gaseous mixture against various points of the mantle.

Liquid Spraying or Atomizing Devices.

MILES, J., HARMES, A., and TAYLOR, W., of the Portslade Gas-Works, Brighton.

No. 1690; Jan. 24, 1908.

This invention relates to devices in which the spraying or atomizing is accomplished by centrifugal action—designed to break up the liquid "into finer particles than has hitherto been usual in sprayers of the centrifugal type, and, though of general application, is more particularly designed for injecting liquid hydrocarbons into the carburetting chamber of carburetted water-gas plant."



Miles, Harmes, and Taylor's Atomizing Device.

One form of the appliance was illustrated last week (p. 790). The modified form shown herewith, with a tapering or conical passage B, has its outer end portion serrated, as by forming fine radial saw cuts C therein. The serrated portion of the nozzle may be flared or parallel (as shown). Moreover, the serrations, instead of extending entirely through the wall of the nozzle, may be in the form of internal grooves.

In all the arrangements, the oil or other liquid is supplied to the passage B through small inclined holes D in a disc or diaphragm E; the holes being so arranged as to impart a rotary or spiral motion to the jets or streams of liquid before they are discharged through the nozzle. The rapidly rotating liquid impinging against the more or less sharp edges of the serrations, is broken up, and, on leaving the spraying device, becomes distributed in a fine mist.

The diameter of the orifice is made according to the consistency of the liquid and the quantity it is desired to pass in a given time; the greater the speed of rotation, and, consequently, the greater the centrifugal force, the finer the particles into which the liquid is broken up.

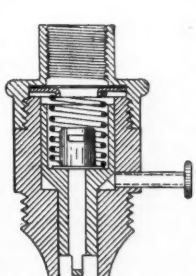
In carburetted water-gas plant, it is important, the patentees point out, for reasons of economy, to spray the liquid hydrocarbons into the carburettor in as nearly a vaporous state as possible. "Under these conditions, it covers in a more nearly uniform manner the whole section of the carburetting chamber, and therefore each particle of oil is subjected to the same treatment in passing through the fire-brick chequer-work. Moreover, under these conditions, the chequer-work more efficiently cracks the oil and keeps cleaner and at a more even heat than where the oil distribution is not so uniform."

Nozzles for Inverted Incandescent Gas-Burners.

GRAETZ, M., of Berlin.

No. 4451; Feb. 27, 1908.

This invention relates to the regulating devices employed with the gas-nozzles of inverted incandescent gas-lamps, and especially such as are described in patent 18,742 of 1905; the object being to provide "a construction in which the moving regulating part is under better control and is not liable to jam or otherwise becoming inoperative."



Graetz's Inverted Burner Nozzle.

The improved nozzle (as shown) comprises a hollow regulating member (within the gas-nozzle casing) through which the gas passes to the nozzle outlet. This hollow member is movable axially, by any suitable actuating device not subjected to the gas pressure, against the action of a spring; and, further, it is provided with a head of enlarged diameter guided within the nozzle casing. Within this head the spring is arranged. The spring is also adapted to loosely hold a dust-catcher, so that all the parts of the nozzle can be readily dismantled for cleaning or renewal.

Quality of London Gas.—The Public Control Committee reported to the London County Council at their meeting last Tuesday that proceedings were taken against the Gaslight and Coke Company in respect of deficient illuminating power in the gas at the Council's testing-station in Spring Gardens on June 30 last year; the illuminating power being equal to only 14·90 candles, as compared with the statutory obligation on the Company to supply gas of 16-candle power. The case was heard by the Chief Gas Examiner, at the office of the Metropolitan Gas Referees, on the 14th ult., when a forfeiture of £25 was imposed—the amount being payable to the Receiver of the Metropolitan Police District.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Refractory Material.

SIR,—I have read Mr. F. J. Bywater's paper, on "Refractory Material," with great interest and appreciation. While most of the English sources of supply are dealt with very fully, there is no mention of the decomposed granites of Devon and Cornwall, from which large quantities of fire-bricks are made.

These decomposed granites are largely worked at Leamore, on the borders of Dartmoor, and also at Gunnislake, in Cornwall. They are very free from iron and alkalies, and contain a good proportion of pure clay material; also a proportion of free silica of just the degree of coarseness that Mr. Bywater specially commends as adding to the refractoriness of the fire-bricks and tiles manufactured from them.

The bricks from Gunnislake have long been, and are still, extensively used in His Majesty's Dockyards at Plymouth, and also for the linings of water-tube boilers on the ships in the Navy.

I have personally tested the Gunnislake bricks by having them built into the combustion chamber of a retort-setting along with some of the best Staffordshire fire-bricks, and have found them equal to the latter in every respect.

I am not aware that this material has been used for retorts; but tiles up to 24 inches by 18 inches are manufactured from it with satisfactory results. The bricks are white in appearance; show very little expansion on heating; and are strong and durable in use.

H. C. HEAD.

Winchester, June 27, 1908.

PARLIAMENTARY INTELLIGENCE.

UNOPPOSED GAS BILLS.

The Unopposed Bills Committee of the House of Lords presided over by LORD ONSLOW, had before them on Tuesday last several Gas Bills.

Southwell District Gas Bill.

In this Bill, a question was raised on clause 49 as to the appointment of Auditor. The Chairman said that it was usual in appointing an Auditor that he should be a member of the Incorporated Society of Accountants. It was pointed out by the Agent that the Bill as it stood provided for the Auditor being a member of the Institute of Chartered Accountants; but an amendment would be inserted adding the words "or a member of the Incorporated Society of Auditors."

The Bill as amended was ordered to be reported.

Bromley and Crays Gas Bill.

This Bill was supported by the Chairman, Mr. Alexander Dickson, and the Secretary (Mr. W. H. Amos), who both gave evidence. The Bill was reported, with amendments.

Gas Orders Confirmation Bill.

A Gas Orders Confirmation Bill, the object of which is to confirm certain Provisional Orders made by the Board of Trade under the Gas and Water Works Facilities Act, 1870, relating to Caldicot and District Gas, Rainford Gas, Rothwell Gas, Tenterden and District Gas, and the Woolmer and District Gas undertakings. A question was raised on the clauses which related to the price to be charged in each instance for the gas, and the working of the sliding-scale, as to whether there ought not also to be a reserve or revenue fund. Ultimately, it was agreed that the Bill should stand over awaiting a report on the question.

LEGAL INTELLIGENCE.

KENT COUNTY GASLIGHT AND COKE COMPANY, LTD.

On Tuesday, June 23, Mr. Justice Swinfen Eady heard an application for the removal of the name of Mr. Arthur Handley from the list of contributories in the winding-up in respect of ten preference and ten ordinary shares, on the ground that the application was revoked and cancelled before notice of allotment was posted. On May 16 last year application was made, and on the 19th, at 2.56, a telegram was sent revoking the application. This telegram was sent out from the receiving office at 3.12; and it was agreed that the postmark (4.15) on the envelope showed that the allotment notice must have been posted between 2.45 and 3.45. The short question for the Court was whether the telegram was received before the allotment letter was sent out. After hearing the evidence of Miss Thompson (the Secretary), Miss Morris, a clerk in the Company's employment at the time of the allotment, and Mr. Claude Audain, who was employed by Mr. Darby, the promoter, to superintend the clerical staff—and who stated that all withdrawals were accepted up to the time of the letters being posted, and that the telegram in question came after the letter had been posted, and was opened by Mr. Archer, the Chairman, who ordered the endorsement "too late" to be put on, His Lordship said he thought the evidence could not be relied upon, especially having regard to the fact that Mr. Archer, who could have cleared up the matter, had not been called as a witness. He thought the telegram was received before the allotment letter was posted; and therefore the name would be removed from the register.

THE POLLUTION OF AN EDINBURGH BREWERY WELL.

A Settlement Arrived at.

In the Court of Session, in Edinburgh, on Tuesday of last week, Lord Johnston began the hearing of evidence in the action by Messrs. James Muir and Son, Limited, of Calton Hill Brewery, Edinburgh, against the Edinburgh and Leith Gas Commissioners. The pursuers sued for £15,000 as damages for the pollution of their "Brewery" well in the brewery in North Back of Canongate, by tarry matter escaping from the now disused gas-works of the Commissioners in New Street, Edinburgh. In defence, it was admitted that there had been pollution; but it was maintained that the source of the pollution had been discovered and stopped, and that means had been taken for the cleansing of the polluted strata lying between the gas-works and the brewery, so that it was only a question of time when the pollution of the well would cease. It was pleaded, too, that the sum sued for was excessive. The Commissioners made a tender of £4000 and expenses.

Mr. *Robert Brown*, a Director of the Brewery Company, recounted that in a former action by them against the Commissioners for the pollution of the "Stable" well in their brewery, in which they sued for £10,000, decree was given in 1905 for £3730 and expenses. Since then their other well—that which was the subject of the present litigation—had also become polluted. The result of the pollution of both wells had been that sales had been seriously affected, and the Company had been brought pretty well face to face with ruin. The average output had come down from £40,000 to about £29,000 per annum; and the profits had diminished from £2500 to about £700. He thought that they should be compensated as for the total loss of their business. Supposing the Commissioners provided them with as good a supply of water as they formerly had, he thought they should receive £2000 as damages, in addition.

Robert Henderson, a well sinker, said the "Brewery" well was foul. The smell in it was very strong. The defenders sank a well within their works, and drove mines north and south. In the north mine they reached the stream of pollution. He had seen the tarry matter oozing from the sides of the mines. In the defenders' works there were two tanks at the western extremity. One of them had been the tank of a carburetted water-gas holder, and in one of them coal-gas tar had been stored at one time. In July, 1907, he saw the tar-tank being dismantled. There was tar flowing round the outside of the tank into a rubble drain. On Aug. 30, a good deal of the tar had been cleared away; but there was still a considerable quantity flowing round the casing of the tank. On Sept. 27, there were streaks of tar coming in at the north side of the south tank, and in the north tank there was an accumulation of tarry matter in the ground below the tank. The defenders had been lifting the bottom plates. On Oct. 25, the tanks had been filled with water. He could not see anything for the water. There were tracks in the ground round about, and tar was oozing into the tanks. The ground seemed to be saturated with tar. A syphon trap had been put into the "Stable" well in the brewery. On April 24 last, he found 1⅝ inches of tar in the trap. On May 29, there was again 1⅝ inches of tar in the trap. In the "Brewery" well tar was oozing out of a fissure in the white, hard stone. He did not think ten years would see the end of the pollution; he could not name any time.

Mr. *G. H. Gemmell*, F.I.C., Public Analyst and Examiner in Chemistry for the Royal College of Surgeons, of Edinburgh, said, along with representatives of the defenders, he made regular visits to the wells in the brewery and to the defenders' works, and took samples, which he analyzed until pollution was admitted. He produced these samples. No. 33 was from the bottom of bore No. 1 in the gas-works. When taken it had a distinct tarry odour. This odour, he thought, was now somewhat masked by decomposing sewage. Generally speaking, there was very much tar underneath the gas-works. Samples of water from the high and low wells in the gas-works, taken on May 10, 1907, were partially analyzed, and were, generally, very highly polluted with sewage; and there were traces of tar. He could not say what proportion of the pollution was directly due to pollution from the gas-works. He understood that at one time sewage water was taken from the common sewer into the gas-works for the purpose of quenching coke. The sewage was drawn into wells, and was pumped from them. Probably the contamination he observed was derived from that source. On Aug. 3 he visited the two tanks in the gas-works. The water had been pumped out. There was water draining in, polluted with tar. Most of the tar was of brown colour, and was obviously carburetted water-gas tar. But there was also a stream of thick, black tar percolating from the north into the south tank, which was coal tar. The north tank had been the coal-tar tank. On Jan. 31 last, when he found the tanks full of water, he was told that it was town's water which had been pumped in about six weeks before, in order to wash the tar through the strata—the ground having been previously cleared, as far as possible, of tar. The idea was that the water might drain through the ground and wash the tar out of the strata. He was also told that they had discovered, or devised, a method of treating the water in order to remove the tar from the strata.

On Thursday morning, after a conference, Counsel intimated that a settlement had been arrived at. A joint minute was lodged, and in terms of it Lord Johnston gave decree.

The joint minute stated that the action had been settled on the footing that the defenders are to pay the pursuers £4600 and expenses; that in the event of the pursuers ceasing to pump either the "Stable" or the "Brewery" well, the defenders are to be entitled to fill the well or wells from which pumping has ceased, and the mines connected therewith, with coke dust and breeze; that in the event of pollution thereafter appearing on the surface of the wells, the defenders are to be entitled, at such convenient times as may be arranged with the pursuers, to remove the pollution and to re-fill the wells; that in the event of the pursuers selling their premises, it shall be declared in the disposition of the subject that the purchasers and their successors shall have no claim against the Commissioners or their successors, in respect of pollution of the subjects by tarry material coming to the subjects from the Commissioners' premises, through any operations of the defenders prior to this date.

TECHNOLOGICAL EXAMINATIONS, 1908.

Pass Lists.

The Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus) has issued the pass-lists in connection with the recent examinations in "Gas Engineering" and "Gas Supply."

EXAMINATIONS IN "GAS ENGINEERING."

The candidates who satisfied the Examiner (Mr. A. F. Browne, of Vauxhall) numbered 155—viz., 11 First-Class Honours; 40 Second-Class Honours; 36 Ordinary Grade, First Class; 68 Ordinary Grade, Second-Class. The names are as follows:—

HONOURS GRADE.

First-Class.

Barrett, A.	Elliott, G. H.	Jackson, W.	Singleton, H.
Briggs, F. C.	Evans, O.	Langford, C. G.	Stone, H. E.
Dougall, P.	Horrocks, H.	Popham, F. J. W.	

Second-Class.

Bamber, G. A.	Foster, A. S.	Marland, P.	Ruthven, R. H.
Barraclough, A.V.	Franks, J. W.	McLeod, L. F.	Seymour, C. C.
Bradshaw, J. R.	Glover, R. B.	Moore, E. S.	Shepherd, C. E.
Brown, J.	Handley, H. C.	Neill, R.	Springfield, H. O.
Brown, J. T.	Hogg, W. T.	Nice, A. J. N.	Staley, R.
Billingsley, H. H.	Holt, C. E.	Pettigrew, W.	Stevenson, G. S.
Chester, R. P. C.	Higgins, F.	Precious, J. W.	Sutcliffe, J. G.
Cotton, H. F.	Hill, A. L.	Punnett, H.	Tooby, C. F.
Croft, C. M.	Lang, J.	Rendle, C. F. W.	Turpie, J. T.
Flower, C. G.	Lawton, C.	Ruggles, F. M.	Wright, H.

ORDINARY GRADE.

First Class.

Batt, F.	Fletcher, R. H.	Lamb, J.	Rosevear, C. E.
Berry, A.	Green, S.	Linnell, T. T.	Scaife, F. L.
Bosher, G. H.	Griggs, A. R.	Lumley, T. J.	Simmons, A.
Brewer, P. P.	Harmon, F.	Maltey, H. S.	Smith, B. F.
Briggs, J. C.	Haynes, G. H.	Messenger, S.	Stewart, E. G.
Carpenter, C. C.	Hazeldine, W. A.	Moore, D. G.	Taylor, G.
Clarkson, H.	Hearson, J. W.	Park, J.	Thomas, O.
Cotten, J.	Hunt, H. A.	Philps, H. G.	Townsend, H.
Dyer, W. J.	Jones, G. B.	Roberts, H. E.	Winslow, G.

Second Class.

Allen, J. H.	Dobson, N.	Kennington, J.	Seaton, W. H.
Andrew, H.	Eastwood, A. I.	Kershaw, T.	Shearer, R. W.
Bamforth, A. S.	Farrer, H. G.	Lowe, H.	Shepherd, D.
Bates, A. E.	Firth, W.	Mansell, H. L.	Siddle, W.
Birks, D.	Ford, R. W.	M'Laughlan, D.	Smallman, S.
Boyers, J. F.	Fullbrook, C. F.	Mills, L.	Smith, J. A.
Broadbent, E.	Geddes, W.	Murray, G.	Sutcliffe, A. R.
Bromage, W. H.	Gulland, W.	Norris, W.	Waldock, S. C.
Brough, J. H.	Haddock, B. M.	Pepper, G J.	Wallace, C. B.
Bullen, A. E.	Hardy, F. A.	Pond, H. G.	Watson, W. J.
Cahalin, D. C.	Hamnett, A. J.	Price, R.	Wellard, L. E.
Carter, W.	Hill, H. C.	Ranft, J. H.	Weller, F. H.
Cawthorne, S.	Holdroyd, G.	Reeves, R. B.	Wilkins, A. H.
Christie, J. C.	Holland, E. L.	Riley, W. H.	Williams, G. B.
Cooper, J. F.	Humble, A. J.	Roberts, E. J.	Williamson, E. H.
Cuthbert, F.	Kendall, G. S.	Robinson, F. C.	Woodroffe, G. F.
Dawes, W.	Kennedy, E. S.	Rogers, H. B.	Wright, A.

EXAMINATIONS "IN GAS SUPPLY."

In this section, the Examiner (Mr. J. H. Brearley, of Longwood) passed as satisfactory the papers of 140 candidates—viz., 8 in First Class Honours, 19 in Second Class Honours; 47 in the First Class Ordinary Grade, and 66 in the Second Class Ordinary Grade. The names of the successful candidates are given below:—

HONOURS GRADE.

First Class.

Bradshaw, J. R.	Chester, W. H. A.	Mitchley, J. W.	Rendle, C. F. W.
Brearley, J. W.	Denford, A.	Monk, W.	Turpie, J. T.

Second Class.

Ablet, E.	Elliott, G. H.	Pearson, G. C.	Topley, W. H.
Barrett, A.	Holdsworth, C. E.	Rees, C.	Townsend, C. V.
Clark, R. J. H.	Holt, C. E.	Rice, G. H.	Wright, H.
Crane, C.	Holt, J.	Ruthven, R. H.	Young, J.
Dougall, P.	Nicholl, J. W.	Scruton, A. G.	

ORDINARY GRADE.

First Class.

Allen, J. H.	Edwards, A. H.	Lees, F. P.	Sharrock. H. N.
Bedford, W.	Field, G. H.	Mason, W. A.	Simmons, A.
Broadbent, J. A.	Frisch, G.	Martin, R. E.	Singleton, H.
Clark, A. A.	Gadsby, G. S.	May, G. W.	Stewart, E. G.
Collins, W. E.	Harrison, T. W.	M'Laughlan, D.	Thorman, G.
Cotton, J.	Hearson, J. W.	Morgan, H. E.	Torlot, E. E.
Cunningham, A. M'K.	Hickman, P. J.	Park, J.	Vere, M. C.
	Hodgkin, N. B.	Pawson, E. G.	Webber, A. H.
Dawling, J. E.	Kerdel, H. L.	Porteous, W. V.	Wellard, L. E.
Dixon, F. W.	Lamb, J.	Pullar, J. J.	White, O.
Durward, E. S.	Lang, J.	Quantrill, E. A.	Winslow, G.
Dyer, W. J.	Last, F. A.	Reed, J. L.	Wright, A.

Second Class.

Ardley, R. P.	Chapman, L.	Holdroyd, G.	Ranft, J. H.
Andrew, H.	Clarke, W. H.	Holland, E. L.	Rudge, C. A.
Ashford, A.	Clarkson, H.	Hoxley, H.	Sands, R.
Ball, W. R.	Cooper, J. F.	Kelley, H.	Schofield, T.
Bamford, F.	Craggs, E. F.	Kemplay, L. M.	Seaton, W. H.
Beardmore, T. J.	Dawling, A. G.	Lloyd, G. H.	Siddle, W.
Becket, W. H.	Dean, J. H.	Lumb, A.	Saidmore, B.
Bell, A.	Dees, W. J.	Lumley, T. J.	Stevens, A. S.
Brady, W. J.	Ford, R. W.	Monks, J.	Stiff, C. J.
Broadbent, E.	Grant, W. A.	Oughton, E. L.	Torry, W. R.
Bromley, F. J.	Green, S.	Page, V. J.	Walters, B. H.
Brown, J.	Gulland, W.	Payne, W. E.	Watling, S. B.
Browne, P. E.	Halstead, P.	Pendlebury, J. R.	Watson, S.
Buckley, A.	Hayton, J.	Pettigrew, W.	White, W. W.
Buckley, J. E.	Hazell, W. B.	Phillips, G. C. D.	Whiteley, C.
Bullen, A. E.	Hinchliffe, F. D.	Potts, P. C.	
Cahalin, D. C.	Hoare, A. W.	Pound, R. S.	

PLYMOUTH GAS COMPANY.

Past Year's Working—Agreement with the Coalite Company.

The Annual Meeting of the Plymouth and Stonehouse Gas Company was held last Thursday, at the works—Sir JOSEPH A. BELLAMY, the Chairman, presiding.

In their annual report, the Directors stated that they considered the position of the Company highly satisfactory in view of the adverse circumstances to which all gas companies had been subject during the past twelve months. In order to meet the increased cost of coal, oil, and materials generally, it was found necessary to advance the price of gas 2d. per 1000 cubic feet as from September last. From the credit balance, amounting to £25,576, the Directors recommended the payment of a dividend for the half year ending March 31 at the rate of 5⅞ per cent. on the ordinary stock, 9s. 3d. per share on the additional shares, and 8s. 9d. per share on the new shares, Act 1879, less income-tax. This will absorb £9500; leaving £16,607 to be carried to the credit of the next account. In consequence of the increased business of the Company, considerable inconvenience had arisen in providing accommodation for the additional staff at the offices in Athenæum Terrace, and the Directors had acquired the lease of other premises in George Street, the main thoroughfare of the town. It was hoped that by Michaelmas next the stoves, fires, and fittings department of the Company's general business may be accommodated under one roof. From the accounts, it appeared that the expenditure on capital account during the year was £6941, of which £3544 was for stoves and automatic meters, and £2000 for new buildings, &c., connected with the manufacture of gas. The total capital expenditure now amounts to £400,332. On revenue account, the expenditure was £91,554, as compared with £88,659 last year; and the income was £123,542, as against £117,581. As regards the various heads of expenditure, the cost of manufacture was £77,930, as compared with £74,091; distribution £5614, against £6830; and management £4881, against £4837. On the revenue side, the income from sales of gas increased from £89,567 to £94,171, meter and stove rentals from £6751 to £6919, and sales of residuals from £20,245 to £21,307. The quantity of coal carbonized was 55,151 tons, and of oil used 1,133,342 gallons. There were sold during the year 21,696 tons of coke, 1189 tons of breeze, 779,776 gallons of tar, and 471 tons of sulphate of ammonia.

The CHAIRMAN referred at the outset to the death of Mr. George Cox, a member of the Board for about 20 years; and on his motion a resolution expressing sympathy with Mr. Cox's family was passed. Proceeding, Sir Joseph said that the past year had been one of considerable anxiety to the Directors of the Company. From various causes, there was a considerable rise in the price of coal; and the Durham coal owners put up rates so high that a very large increase in the price of gas seemed inevitable. In the circumstances, the Yorkshire colliery owners came to the rescue of the gas industry; and the Directors were able to conclude contracts at prices which were very much more favourable than those offered by the Durham proprietors, taking into consideration the superior quality of the coal. Unfortunately, difficulties occurred over delivery. The railway companies could not get the coal to Hull and Goole, and there was a block of steamers at these ports. There were claims for demurrage and damages all round; the railway companies said they could do nothing, and the collieries declared that they were not responsible. This went on for months. Fortunately they succeeded eventually in getting part of their supply diverted to Partington, and thence by the Manchester Ship Canal and the west coast to Plymouth. This cost more; but they got over the difficulty, though at times the stocks of coal fell very low. Under the circumstances, he thought the balance-sheet was satisfactory. They had provided out of the profits for the dividend, and they had added £3000 to the renewal fund and £5000 to the fund for the maintenance and depreciation of stoves, automatic meters, &c., which now stood at the respectable sum of £34,655. Although this seemed a large amount, it must be remembered that there were now 14,000 slot installations, and that as there was a large shifting population, the wear and tear was heavy. The Directors wished to put the financial part of the business on a safe footing, and the reserve fund was to provide for the renewals which were already beginning to be required. Provision was made at the works for the repair and maintenance of the stoves and fittings and for the renewal of all worn parts. The increase in the price of gas last September had accounted for part of the increase in the revenue; but apart from this, they had excellent results, for which they had to congratulate their Engineer. The make of gas had been over 11,000 cubic feet per ton of coal—the highest point ever reached in the history of the Company. The superior quality of the Yorkshire coal contributed to this result. But they had had Yorkshire coal before; and this year's results were better than anything they had previously achieved. There was an increased income from coke, the price of which went up in sympathy with the high price of coal. The demand was very good, and they would have sold more if they had had it to sell. There was an increase of just under 1 per cent. in the quantity of gas sold, which, taking into account the poor trade in the town and

the increase in the price of gas, was not at all unsatisfactory. The prospects for the current year were better. They were effecting contracts for coal at a lower price than last year; but, on the other hand, the higher cost at which oil was purchased would affect this year's accounts. It was proposed to reduce the price of gas by 1d. per 1000 cubic feet in September, and by 1d. more in March next. The reduction in March would, however, depend on the fate of the Coal Mines (Eight Hours) Bill. If the measure became law, he was afraid they would not be able to reduce the price of gas; and they might, on the contrary, have to increase it. In his opinion, the Bill was not wanted. It was for the supposed benefit of a small class of the community at the expense of everybody else. Miners were well paid, and their hours of labour in the mines were not excessive. Mr. Gladstone was anxious to obtain the views of the coal consumers; and he had had them. The railway companies, shipowners, gas companies, and the big industrial concerns of all kinds had petitioned against the Bill and were unanimously opposed to it. But though their opinions were invited, they were apparently to be ignored, for the Bill had not been withdrawn, which was the only course that could be taken in the interest of the community at large. The new offices which the Company had acquired would add greatly to the comfort of working; and it would also be an advantage to have the offices and show-rooms together in a central position. There was another matter of some importance, not only to the shareholders in the Company and to Plymouth, but to some extent to others outside. He referred some time ago to "Coalite." A Company was formed for the purpose of treating small coal and producing an article which they named "Coalite"—something between coal and coke. He believed their idea was that the large gas companies would be anxious to make terms with them to take the gas produced in making "Coalite." The London Gas Companies had declined. There had been a good deal of correspondence in the Technical Press as to the attitude of the Gas Companies in London towards the Coalite Company. He knew the Chairmen of the Gas Companies in London very well, and had the highest possible opinion as to their capacity and knowledge of the gas business; and he had no doubt that, in declining to make any arrangement with the Coalite Company, they had acted on particularly good grounds well known to themselves. But, after all, things which applied to London might not apply to places like Plymouth, where the conditions and circumstances were different. The Coalite Company approached them some time last year with a view to starting works in Plymouth in conjunction with the Plymouth Gas Company for the production of Coalite, and the sale by them to the Plymouth Company of the gas thereby made. Interviews took place, negotiations were brought to an issue, and they had signed a contract. This had been concluded on terms which, though confidential, it was his duty to put to a certain extent before the shareholders, so that they would understand they were not speculating on Coalite. The Coalite Company would supply them with the gas which they produced at a lower price than the Plymouth Company could make gas themselves. Conditions had been introduced into the contract to safeguard the Plymouth Company's interests in every possible way, so that if the process and business of the Coalite Company were a success here, it would be very successful for them. On the other hand, if they failed, their Company would lose nothing, and would not sustain even moral and intellectual damages. Indeed, he dared say there would be something on the right side even if this contingency came about. Plans had been prepared, and work would be started at once in the erection of the necessary plant. This was designed to produce some 500,000 cubic feet of gas per day, which was about 18 per cent. of the Company's total make. Should the thing be successful, it would be possible to develop and bring the production up to about one-third of their total make. If it was a success, they would be able to supply gas to the consumers at a still lower price, and thus increase the dividend for the shareholders. With regard to Coalite itself, he had told the Directors of the Coalite Company that his opinion of the people of Plymouth, the people of the Three Towns, was that, if they could get an article which would take the place of coal and would cost less, they could rely upon getting a sale for it. Still it was not going to revolutionize the coal trade of the port. They reckoned upon a production of about 20,000 tons of Coalite a year—not a very large quantity in proportion to the total importation of coal. In view of the very severe criticism which had been passed by the "Gas Journal" on the Coalite Company, particularly in reference to an observation by one of the Directors, that an arrangement had been made with a Gas Company in England by which a fair trial would be given to demonstrate what Coalite was capable of doing, and how beneficial it might be to gas companies, he had no doubt that the Plymouth Gas Company would be subjected to some comment. It had been suggested by the "Gas Journal" that a guessing competition should be set afoot as to the name of the gas company in England who had made this arrangement. That guessing competition came to a close that day. He had disclosed the fact that it was the Plymouth and Stonehouse Gas Company. So they might prepare, perhaps, for some capable article—they were generally very well written articles in the "Gas Journal," very much to the point—and they would have to put up with some criticism. The shareholders might, however, rely upon it that their interests were safe in the hands of the Directors, whose interests were the same as theirs. He concluded by referring to the Directors' continued good relations with their workmen, who, he said, were satisfied with the Company, as the Company were with them; and there had not been any friction during the year. The relations with the staff generally had also been satisfactory, though there had been a little trouble, the greater part of which was due to an error of judgment, which would not, he thought, recur.

Mr. J. H. S. May, the Deputy-Chairman, seconded the motion for the adoption of the report and accounts, which was agreed to, as was also one relating to the payment of the dividend recommended by the Directors. The retiring Directors and Auditor were re-elected.

It was explained by the Chairman, in answer to a shareholder, that owing to the very recent death of Mr. Cox, the necessary steps for filling his place on the Board could not be taken at this meeting.

Mr. Ward moved a vote of thanks to the Engineer, and included in the motion the foremen of the works. He said he noticed that 3000 tons less coal were carbonized last year than the year before. This saving could not have been effected without good management, in which the Engineer must have been well supported by the foremen.

The resolution was carried; and Mr. P. S. Hoyte, the Engineer, in acknowledging it, remarked that he agreed with all that had been said as to the foremen, who he was sure would appreciate this mark of the shareholders' satisfaction.

THE DAYLIGHT-SAVING BILL.

Select Committee Reported to be Favourable to the Measure.

Our readers are probably aware that the Bill introduced by Mr. R. Pearce to obtain legislative sanction to Mr. Willett's scheme for saving daylight has for some weeks been under the consideration of a Select Committee of the House of Commons. The Committee will meet for the last time to-day for the purpose of presenting their report.

According to an article in the "Observer" last Sunday, the Select Committee are strongly favourable to the principle of the Bill; the evidence having convinced them that certain classes of the community, such as farmers, gardeners, and others, who already work by daylight, and others such as miners and thousands of workers employed in ships, would remain unaffected by the Bill. The principle of the Bill has been supported by seventeen or eighteen of the principal Chambers of Commerce—for example, London, Liverpool, Glasgow, Manchester, Bristol, Sheffield, Wolverhampton, Southampton, Halifax, and Oldham—and by the borough councils of a large number of towns. Evidence has been given in its favour by eminent scientific men, such as Lord Avebury, Sir William Ramsay, Sir Robert Ball, Professor Rambaut, and Sir A. Conan Doyle. On the other hand, the Committee have taken due note of the adverse evidence given by the Astronomer-Royal, Sir George Livesey, Mr. Satterthwaite, the Secretary of the London Stock Exchange, Mr. Duckinfield, of the Liverpool Cotton Association, and the Meteorological Department. Of the Railway Companies whose representatives gave evidence, the North-Western, South-Western, Great Central, and Great Eastern were all favourable to the principle of the Bill, except that in the case of the Great Eastern it was pointed out that difficulties would arise in connection with their Continental traffic, which, it was elicited, is 0·137 of the total passenger traffic and 0·05 of the goods traffic. Many representatives of the shop-keeping classes gave evidence in favour of the Bill, as also did Mr. Appleton, the Secretary of the Federated Trades Unions, comprising 125 of the largest of these organizations in the country (practically all of them, with the exception of those of Miners and the Railway Servants), and constituting a membership of 700,000. Mr. Babington Smith, on behalf of the Post Office, declared that as regards the postal business of the United Kingdom, the Colonies, the United States, and other distant countries, the inconveniences caused by the changing of the clock as proposed in the Bill would be so slight as to be practically negligible. As regards the postal services with the Continent, however, he considered that the dislocation caused would be so great that no adjustment of the postal time abroad would really meet the case. Personally, he was adverse to the change.

Arguments for and against the Bill may be summed up as follows:

For.—Saving in the cost of artificial light. This is calculated at £2,000,000 a year in the United Kingdom. Great benefit to health all round by giving daylight for practically all work, and more daylight for recreation. Improvement in most classes of work, particularly textile manufactures, where, all evidence shows, work done by daylight is always better than that done by artificial light. Most railways, most scientists, and the vast majority of business men in favour of the Bill.

Against.—Dislocation of business on the Stock Exchange. The difficulty of making everybody in the country set his watch or clock forward or back at the same moment, and of regulating all public clocks. The difficulties of conducting postal, telegraphic, and telephone business with the Continent. The inadvisability of adding to the existing complications caused by Greenwich, French, and Central European time. The contention that the daylight could be "saved" without altering the clock, merely by legislating for earlier hours of beginning work.

Gas Supply of St. Petersburg.—According to a "Reuter" telegram of the 26th inst., tenders will shortly be invited, through the intermediary of the British, French, German, and Russian Press, for a concession of the St. Petersburg Gas-Works.

Price of Gas at Shoeburyness.—There having been a profit of £543 on the working of the Shoeburyness gas undertaking, Mr. Neil has given notice that he will, at the next meeting of the Council, move that the price of gas be reduced from 4s. 7d. to 4s. per 1000 cubic feet. It was pointed out by another member that a reduction of 6d. would absorb only £250 of the balance.

Gas Suffocation Fatality at Rushden.—On Monday of last week, Mr. Paul Cave, of the firm of Messrs. John Cave and Sons, Limited, boot manufacturers, was found dead in the telephone-room of his factory at Rushden, having been suffocated by gas, of which there was an escape. He was 60 years of age, and had taken a prominent part in the public life of Rushden. At the subsequent inquest, the Jury returned a verdict that the deceased took his life by coal-gas poisoning while temporarily insane.

Brighton Electrical Undertaking Losses.—The accounts of the Brighton Corporation electrical undertaking for the year ended March 31 last make dismal reading for the ratepayers. For the third year in succession a loss is shown; but the amount on the present occasion is less than was the case last year. The exact losses have been—1906, £976; 1907, £10,233; 1908, £3658—total, £14,867. On the three years' working preceding this, there was a total surplus of £20,324. These are the results that have been achieved with an undertaking the capital outlay on which to date amounts to the huge sum of £774,474. The deficit for the past year is being met out of the reserve fund, which is thus reduced to the insignificant figure of £7412.

OLDHAM CORPORATION GAS UNDERTAKING.

Working of the Past Year.

The report of the General Manager (Mr. Arthur Andrew) on the working of the Oldham Corporation Gas Department during the twelve months to March 25 last reveals a satisfactory condition of affairs.

The total expenditure on capital account during the twelve months (after deducting the estimated value of demolished plant, &c.) was £12,907. The gross revenue amounted to £182,167, and the gross expenditure to £146,006; the balance carried to the profit and loss account being £36,161. Deducting from this the annuities during the year (£3376), interest on loans and stock (£12,578), sums payable to the respective sinking funds (£5509), and balance of premium for redemption of stock (£106), there is a net profit of £14 592. Adding the balance brought forward and one year's accrued interest from the annuity redemption fund, and deducting the amount to which the Corporation are entitled in aid of the borough fund (£9066), the credit balance to be carried forward is £20,565. The average price realized for both ammoniacal liquor and tar was lower than during the preceding year; and the tendency of values has been for some time against producers—the fall being most pronounced in the case of tar. There was a considerable increase in the cost of coal and other gas producing and enriching materials during the year, which, apart from the enhanced price obtained for coke, increased the cost of production to the extent of 2d. per 1000 cubic feet of gas sold. The sale of coke, on the other hand, was very good, and was instrumental in bringing down this increased cost from 2d. to ¾d. per 1000 cubic feet sold. Of the coal used, 28 per cent. was supplied at the old contract rates, which were 2s. 6d. per ton below last year's contract prices. The extension of machinery for stoking and the removal of coke from the retort-house, resulted in a further saving in carbonizing wages amounting to £1287. There was an increase in the amount expended under the head of distribution (maintenance of mains) amounting to £1532. This was principally incurred through laying a 24-inch main to Royton; the old pipes having been taken out and their original value charged against revenue. The growth in the number of cookers fixed free also increased the expenditure under the same head to the extent of £243. The cost of fixing cookers free during the year amounted to £1420. A sum of £1500 has been transferred from the reserve fund to the credit of capital account for depreciation of cooking-stoves. This fund has also been drawn upon to the extent of £2650, the estimated cost value of plant and property demolished during the year. The amount in the reserve fund on March 25 was £45,701.

The quantity of gas supplied to the corporate street-lamps and municipal buildings free of cost during the year was 82,463,000 cubic feet. There were 98 additional lamps erected within the municipal borough, and 52 in the out-townships. The total number of lamps fixed in the supply district on the 25th of March was 5587. The total number of incandescent lamps at that date was 1916 within the borough, and 809 in the out-townships; being an increase of 473. More than half the lamps within the municipal borough have now been fitted with incandescent burners. Automatic controllers are fixed on 112 lamps; and after two years' experience of them, the Committee have decided to increase the number by 500. The price of gas for all purposes per 1000 cubic feet (with a discount of 6d. per 1000 feet if paid for within the stipulated period) was as follows: For a quarterly consumption of under 100,000 cubic feet, 2s. 8d. per 1000 cubic feet; 100,000 up to 500,000 feet 2s. 7d.; 500,000 to 1,000,000 feet, 2s. 6d.; 1,000,000 to 5,000,000 feet, 2s. 5d.; and 5,000,000 feet and over, 2s. 3d. For public street lighting, the charge was 1s. 11d. per 1000 feet net. The quantity of gas manufactured at the different stations during the year was: Oldham, 90,141,000 cubic feet; Higginshaw, 739,620,000 cubic feet; Hollinwood, 527,182,000 cubic feet, ditto (water-gas plant), 98,680,000 cubic feet; Royton, 15,811,000 cubic feet—total 1,471,434,000 cubic feet, against 1,413,965,000 cubic feet in the preceding year, being an increase of 57,469,000 feet, or 4·06 per cent. The quantity of coal carbonized was 118,956 tons; and 367,793 gallons of oil, and 72,665 gallons of benzol were used in gas production. The average quantity of coal gas made per ton of coal carbonized was 11,539 cubic feet, compared with 11,256 cubic feet in the previous year. The loss of gas from leakage, &c., was 75,354,000 cubic feet, or 5·12 per cent. of the quantity made, compared with 5·69 per cent.

The total number of meters fixed on the 25th of March was 51,299, of which 1246 are of the prepayment type. There were 711 meters fixed in new premises and others in which gas had not previously been used; and 164 meters were disconnected and services taken out where gas is not likely to be required in the future. The actual number of consumers on March 25 was 45,431. The number of additional cooking-stoves and grillers fixed during the year free of charge to consumers was 1929. The total number in use on the 25th of March was 12,504. During the year, 49 gas-fires, &c., were sold. The increase in the quantity of gas used by private consumers, excluding gratuitous lights, was 61,967,000 cubic feet, of which 33,133,000 cubic feet was consumed in houses and shops, and 28,834,000 cubic feet in mills and works.

The laying of a 24-inch main from Middleton Road, Chadderton, to Royton was completed during the year. This main has caused the Royton works to be unnecessary; and they will consequently be shortly demolished. Gas was made at the works for the last time on Oct. 13, 1907. Though the naphthalene trouble has not entirely disappeared, Mr. Andrew says that the means adopted for dealing with it have had satisfactory results; and the complaints by consumers have been comparatively few. Additional machinery for charging and drawing retorts, and for the conveyance of coke, has been installed at Hollinwood; and contracts have been made for replacing a set of old purifiers with others of a larger and more modern type at the same station. Other improvements and enlargements in plant in connection with the gasholder outlets and district governors have also been carried out.

At the Mechanics' Institute, Stockport, an exhibition is being held of Messrs. Fletcher, Russell, and Co.'s gas-cookers; free lectures being given daily by Miss H. H. Tutford.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

The accounts of the Longton Corporation Gas and Electricity Department for the year to March 31 were presented to the Town Council at their meeting last Thursday, and adopted.

In the report of the Committee (which is signed by the Chairman, Alderman E. Brookfield, J.P.), they stated that the total quantity of gas made during the year was 154,450,000 cubic feet, being an increase on the previous year of 3,374,000 cubic feet, or 2·2 per cent. The gas sold for the year showed an increase of 5,740,000 cubic feet, of 4·1 per cent. The gas unaccounted for through leakage, &c., equalled 4·54 per cent. This is the lowest leakage account recorded in the history of the undertaking. The price of coal during the past year increased 30 per cent.; but fortunately the Committee had considerable quantities bought at the old contract price, and consequently the full effect of the advance was not experienced during the period under review. The gross profits on the year's working amount to £12,783; and after providing for interest and sinking fund charges on capital, amounting to £6171, there remains a net profit of £6612, which has been dealt with as follows: Paid over to borough fund in relief of rates, £2500; paid over to reserve and depreciation fund, £500; expended on fitting up cottages (slot system), £423; expended on new mains, £455; expended on new meters, £803; paid off remainder of debit balance gas-works, £874; paid off debit balance (electricity works), £512; and paid off capital account, £2—making a total of £6069, and leaving a balance to be carried forward of £543. The total amount of profit paid over to the borough fund in relief of rates since the purchase of the gas-works by the Corporation amounts to £65,397.

The working of the Electricity Department shows a net profit of £20; the number of units sold being 49 per cent. more than in the preceding year. There was a debit balance of £532 brought forward; and deducting the net profit of £20 realized on last year's working, left a debit of £512, which, as indicated above, has been paid by the Gas Department out of their profit.

The Engineer and General Manager (Mr. W. Langford), in his report to the Committee, remarked that the buildings, plant, machinery, and works generally have been improved and extended, until they are now equal to an increased output of about 80 per cent. without further additions being made to capital. The quantity of gas sold shows a steady increase. The gas sold per customer has been gradually diminishing through the ever growing use of incandescent burners; but such losses have been more than made good by the rapid development of the slot-meter system. The fitting up of small houses with a supply of gas is much appreciated by the artisan. It also gives a broader basis of supply; and thus the gas undertaking has become a more secure and valuable asset to the town, as shown by an increase in the quantity of gas sold of more than 4 per cent. for each of the three last years. Mr. Langford quoted the following figures in order to illustrate these remarks:—

	1908. Cubic Feet.	1907. Cubic Feet.
Gas sold for motive power	11,571,000 ..	11,462,200
Gas sold for lighting and heating purposes	63,472,000 ..	64,051,000
Gas sold for lighting purposes (slot meter)	50,040,600 ..	44,365,800
Gas sold for public lighting	20,070,000 ..	20,070,000

The receipts from the sale of gas (£21,958) show an increase of £935; while residual products realized £5730, as against £4760. For coke, £903 more was received; and for sulphate of ammonia, £85 more. The make of gas per ton of coal last year was 12,328 cubic feet, and the quantity sold 11,630 cubic feet. The amount of coke sold per ton of coal carbonized was 11·5 cwt. "These and other figures, combined with the general financial results," says Mr. Langford, "show the year to have been the most successful on record." With this statement the Committee are quite in agreement; and they have passed a hearty vote of thanks to Mr. Langford, whose efforts they thoroughly appreciate.

When the Committee's minutes came before the Council on Thursday, Alderman Brookfield moved their adoption; and Mr. Hulse, in seconding, gave some figures showing the development of the gas undertaking. He said the works were bought in 1878, and the amount paid for the undertaking was £77,664. The make of gas for that year was 65 million cubic feet; while the leakage, or unaccounted-for gas, was 13·28 per cent. The make of gas for the year just ended was 154½ million cubic feet; and the leakage had been reduced to 4·54 per cent. The price of gas up to 1885 was 3s. 6d. net per 1000 cubic feet, with an extra charge for meter-hire; the price to-day was 2s. 9d., with no meter-hire. One difficulty they had to contend with was that they had a very large capital account, so that if their price of gas was 1d. or 2d. above that of others, it was not because they could not manufacture the gas quite as cheaply. The Committee had made strenuous efforts to bring this account into a more healthy state by increasing the output of gas and by refraining from making further additions to capital in the form of loans; while at the same time increasing the capacity and efficiency of the works, machinery, and plant. This had been successfully accomplished out of profits; and in this way had been paid the following sums: Water-gas plant, £7669; coke and coal waggons, £694; machinery, £115; special items, £3934; deficiency account, £3546; capital expenditure (gas), £1450; reserve fund, £1500; electricity works, £3289. These and other sums had been met without decreasing the amount contributed in relief of rates, and while keeping the price of gas at the level of surrounding towns. The working results were exceptionally good. Last year, out of the published returns of 121 gas undertakings in various parts of England, Longton came out an easy second; having produced an average of 12,260 cubic feet of gas per ton of coal used. The Gas Committee felt that at the end of the present quarter they would be able to very materially bring down the price of gas to consumers. During the last few weeks experts, friendly and otherwise, had examined their gas-works; and they had been unanimous in saying that the Longton works were second to none in the Potteries. In conclusion, he spoke in highly complimentary terms of Mr. Langford's management of the works.

Several other members referred to the satisfactory position of affairs; and the minutes were adopted.

OLDBURY GAS UNDERTAKING.

The General Manager of the gas undertaking of the Oldbury Urban District Council (Mr. Adam Cooke) has presented the statement of accounts for the year ended the 31st of March last.

The net revenue from the sale of gas to consumers by meter, at prices ranging from 3s. 4d. down to 1s. 6d. per 1000 cubic feet (the last-named figure being for gas used for motive power), and also for public lighting and under contracts, was £15,440; the sale of residuals produced £4265; and the total receipts were £19,938. The manufacture of gas entailed an expenditure of £10,676; distribution cost £2363; management, printing, &c., £377; and public lighting and rents, rates, and taxes made up a total of £15,561—leaving a balance of £4377. Dividend on Consols and bankers' interest brought this up to £4445, out of which £2105 was paid as interest, £956 was required for the sinking fund, and £600 was transferred to the general district rate account; leaving a sum of £784 as the net profit. Adding £9209 brought forward, produced £9993. The working statements show that 9770 tons of coal were carbonized, and 32,726 gallons of oil; the quantity of gas made being 132,542,000 cubic feet. Of this, 110,428,000 cubic feet were sold by meter (compared with 101,726,000 cubic feet in the previous year), 14,400,000 cubic feet were consumed in the public lamps, and 2,172,000 cubic feet were used on the works; making a total of 127,000,000 cubic feet, and leaving 5,542,000 cubic feet, or 4·36 per cent., unaccounted for (as compared with 5 9 per cent. in the previous year). The residuals produced in the twelve months were: Coke, 6105 tons; breeze, 19 tons; tar, 119,013 gallons; ammoniacal liquor, 237,320 gallons; and sulphocyanide, 46,425 gallons.

SOUTHPORT ELECTIVE AUDITOR'S REPORT.

In his report for the past year as Elective Auditor of Southport, Mr. Samuel Hardman deals at some length with the Gas Department. The following are a few of his remarks under this head: "I have not hesitated in the Press to call attention to what I believe an unsound system of taxation—charging monopoly prices for gas, water, electricity, and other services, and applying so-called profits in relief of rates. The ratepayers should clearly understand that to show a huge fictitious profit on the gas estate, and to charge 2s. 8d. per 1000 cubic feet of gas, whereas the consumer at Widnes is supplied at 1s. 2d., is one of the most vicious forms of indirect taxation it is possible to conceive, and that the rates which are fixed on such a basis are fixed on an utterly unsound basis. Moreover, for the glorification of showing these huge paper surpluses of gas profits, which are a mere sham, income-tax at the rate of 1s. in the pound is paid to the National Exchequer, every shilling of which belongs rightfully to the ratepayers. The price of gas and electricity should be reduced to net cost to the consumer. The high price of gas constitutes a tax on those least able to pay. The broader social interests of the community demand that the use of gas both for lighting and cooking should be as widely encouraged as possible; and anything which tends to maintain a high price is an obstacle to social progress."

After dealing with the Water, Tram, and Electricity Departments, he concludes: "My investigations of the results of municipal trading at Southport lead me to the conclusion that the ratepayers are not so well served as in towns where the public services are in the hands of companies, and that there is no element of blessing in municipalization to compensate for the indifferent character of the service rendered; and I believe the members of the Corporation will think a good many times before they again take the responsibility of advising the ratepayers to embark on the seductive but slippery slopes of municipal trading."

KENDAL GAS AND WATER UNDERTAKINGS.

At a recent Meeting of the Kendal Town Council, the Gas and Water Committee presented the report for the past year of the Manager (Mr. W. R. Wilson), which stated that in the Gas Department the total receipts on revenue account amounted to £14,610, and the expenditure was £11,049, showing a gross profit of £3561. Interest on debentures absorbed £2022 (less £198 interest from bank and on reserve fund investments), and the sinking fund £926, leaving a surplus of £811. Out of this, £760 was voted in relief of the rates. The reserve fund remained at £5000; and the sinking fund, including debt repaid, at £11,053. The gas made amounted to 85,880,800 cubic feet; being an increase of 2,078,800 cubic feet, or 2·48 per cent. The total number of consumers now on the books was 3302, or an increase of 48 over the previous year. The output of gas shows an increase of 1,848,300 cubic feet, or 2·41 per cent., and the income an increase of £250. In the Water Department, the total receipts on revenue account amounted to £3768, and the expenditure to £1387; the gross profit being £2381. Interest on debentures absorbed £1589 (less £37 bank interest), and sinking fund £736, leaving a surplus of £93. The sinking fund (including debt repaid) stood at £9345.

In moving the adoption of the minutes of the Committee, Alderman Monkhouse said the Gas Department had done remarkably well. The question that exercised their minds at the beginning of the year was the probability of a rise in the price of coal. This took place; and they had to pay 2s. 6d. a ton more, which, on the usual quantity carbonized, meant practically £1000. But in accepting their contracts, they exercised the option of either having the coal screened or unscreened; the unscreened being about 1s. a ton cheaper. The result was that, by using the two together, the Manager had been able to reduce the price to very nearly what it was the previous year. The residuals had done exceedingly well. While they were economizing in various ways, the works had not been starved or neglected. On the repairs and maintenance of the plant and works £941 had been spent last year, against £650; and yet there was a net surplus profit, after paying interest and redemption, of £811. He thought it was only fair to Mr. Wilson to say that he had accomplished more than any Manager had done before, inasmuch as he had produced more gas per ton of coal. The illuminating power had been maintained on an average at 17·35-candle power. It was rather interesting to notice that in 1896 the total quantity of gas sold was 46,694,000 cubic feet; whereas last year they had actually sold 78,499,000 cubic feet. They were confronted this year with the loss of one of their best customers—he referred to Netherfield. On the other hand, they were looking about in order to see what they could make up in other directions; and at the present time they were in negotiation with the Burneside people, and there was every prospect of an arrangement being come to by which the Corporation would supply that place with gas. While this would not, perhaps, for some years make up the deficiency caused by the loss he had referred to, it would to a considerable extent counterbalance it. In addition to what they had done in the way of reducing the price of gas from 3s. 6d. to 2s. 8d. per 1000 cubic feet, and abolishing meter-rents, they had paid their way and improved the works considerably. They had in the reserve fund £5000, and in the sinking fund £10,000; and they had given to the relief of the rates a sum of £5290, which made a total of over £20,000 that had been absolutely saved to the ratepayers. Compared with last year, their coal bill this year would be less by about £200. With regard to the Water Department, he was happy to say that it had "whipped its own top." The consumption of water, however, still continued to be very excessive. The Manager had been indefatigable in his endeavours to reduce this waste and leakage. The question of Birds Park reservoir had just had their attention. It was well-known this reservoir leaked above a certain height—anything above 18 ft. 6 in.; and sooner or later they would have to face the question of considerable cost in the attempt to remedy the leakage.

The minutes were adopted.

COAL MINES (EIGHT HOURS) BILL.

Opposition by Chambers of Commerce.

A Conference of Delegates from Chambers of Commerce in the United Kingdom was held in the Council Chamber of the London Chamber of Commerce, Oxford Court, on Monday of last week.

Mr. Charles Charleton, the Chairman of the London Chamber, presided over a representative gathering; and, welcoming the delegates, he said they had come together for the purpose of defending their commerce against the peril of dearer coal. The Bill would mean dearer coal; and it had been promoted by the Miners' Federation solely with this end in view. Up to the present, the Government had scouted the resolutions which had been passed by Chambers of Commerce throughout the country, and by the Associated Chambers at their recent meeting in London. They had met now to pass another resolution; and, if this resolution were ignored, and the Government persisted in passing a Dearer Coal Bill, they would show the Government that politics were a secondary consideration with them, and that they were capable of uniting throughout the length and breadth of the land to fight effectively in the interests of the country's trade. He proposed the following resolutions: "That this Conference of Delegates from Chambers of Commerce in the United Kingdom, specially convened on the eve of the second reading of the Eight Hours Bill, desires to record its conviction that the measure in question, if passed into law, must disastrously affect the industries of the whole country. This conference re-affirms the resolutions previously passed, and is of opinion that no justification whatever has been furnished for a Bill which has been condemned, with practical unanimity, by the commercial bodies of the whole country. This conference calls upon the members of commercial communities to rise above political considerations, and defend the country's commerce, and, to this end, to offer to the Government at all stages of the Bill relentless opposition, both in the House of Commons and in the country. This conference further pledges itself to give the utmost possible support, financially and otherwise, to the Coal Consumers' Defence League, and thus enable that body to combat the Bill with increased effectiveness. This conference further resolves that copies of the above resolution be immediately forwarded to the Right Hon. H. H. Asquith, K.C., M.P. (the Prime Minister); the Right Hon. Herbert Gladstone, M.P. (Home Secretary), and to Mr. J. F. Mason, the Chairman of the Parliamentary Committee of the Coal Consumers' Defence League."

The resolutions were seconded by Mr. A. J. Hobson, the President of the Sheffield Chamber of Commerce, and supported by Mr. J. A. Lloyd, Ex-President of the Wolverhampton Chamber of Commerce, Lord Provost Longair, Vice-President of the Dundee Chamber of Commerce, Mr. Alex. Forbes, Ex-President of the Aberdeen Chamber of Commerce, Mr. G. Henry Wright, Secretary of the Birmingham Chamber of Commerce, Mr. F. J. Bowles, Secretary of the Falmouth Chamber of Commerce, and Mr. Charles Bennion, President of the Leicester Chamber of Commerce. They were carried unanimously.

Birmingham Gas-Coal Contracts.—The Birmingham Gas Committee last week considered tenders for the supply of 600,000 tons of gas coal required during the year. Tenders were received for about 2,500,000 tons; and the price at which offers were accepted represents a saving of £25,000 as compared with last year. An estimate of the income and expenditure for the current year is being prepared by the Secretary (Mr. G. Hampton Barber), and will be submitted at the next meeting of the Finance Sub-Committee, when the price of gas will be reviewed.

Gas-Works and River Purification.—According to an official statement recently issued, showing the results of the action taken by the Thames Conservancy for the purification of the river and its tributaries, the Gaslight and Coke Company spent £10,000 to comply with the Conservators' notice served in 1895 in respect of the works at Beckton. The effluent during last year was not altogether satisfactory; and some further measures were taken with a view to effecting an improvement. The effluent from the works of the South Metropolitan Gas Company at East Greenwich continues to be satisfactory.

NEW GAS-WORKS AT BUDE.

A large number of the inhabitants of Bude and the neighbourhood assembled on Thursday for the formal opening of the works which have been constructed for supplying the town with gas. The site covers about three-quarters of an acre. The retort-house contains five retorts, which are capable of producing 20,000 cubic feet of gas per diem. The capacity of the gasholder is 12,000 cubic feet. Messrs. Willey and Co., Limited, of Exeter, constructed and erected the plant; while the buildings, which are conveniently arranged, were put up by Messrs. Williams and Carnall.

Canon Bevan (of Stratton), in asking Captain F. W. Lashbrook to open the works, said they all felt the district had a great future before it, and they were glad to welcome any undertaking of this kind among them. Mr. J. H. Treleven seconded. Captain Lashbrook remarked that it had always been his aim to promote the interests of Bude and district; and he believed that gas would be a great boon to them. A want long felt was now supplied, though opposition and difficulties had had to be surmounted. He then declared the works open, amid applause.

Mr. Capes (Chairman of the Directors) thanked Captain Lashbrook, on behalf of the Company. He believed the undertaking would prove a success financially and in every other way. Mr. Blatchford seconded, Mr. Rattenbury supported, and the motion was carried unanimously.

GAS AFFAIRS IN NEW YORK CITY.

According to "Progressive Age," the trial has not yet come off of the action brought by New York State Attorney-General Jackson to oust the Consolidated Gas Company from the streets of New York City, although a hearing on a demurrer by the Company was heard before Justice Erlanger, of the Supreme Court, on the 8th inst. This action was begun last July; but a number of motions have delayed the trial of the suit. The Company by its demurrer, raises the question squarely whether the complaint constitutes a cause of action, and also whether the Court has any jurisdiction in the matter, and whether the plaintiff (the people of the State of New York) has any legal capacity to sue. The Attorney-General desires to compel the Company to remove its mains, on the ground that the special or subsidiary franchises granted by the City to enable the Company to dig up the streets have expired, and that the Company is now a usurper and trespasser upon the property of the Municipality. Counsel who appeared for the Company in support of the demurrer said: "It is alleged in the complaint that the defendant was duly organized in 1884 for a period of fifty years, by the consolidation of six Gas Companies, and that the Consolidated Companies had obtained franchises under which they laid their mains. The legal conclusion is pleaded that each of these franchises has expired; but it is not alleged that any mains have been laid since such expiration." He stated that the permission of the Court was first necessary to bring such a suit, and continued: "As a matter of fact, permission to bring such an action was refused by this Court. Having failed to obtain leave to bring an action to annul the corporate existence on the ground that the defendant was unlawfully exercising franchises, the Attorney-General has commenced the present action under section 1948 of the Code of Civil Procedure." Counsel also declared that a Court of Equity should not interfere with the use of the city streets at the instance of the people of the State when the matter could be dealt with by the local authorities. "In the 80-cent. gas case, in the Federal Court, it was expressly adjudicated that the franchise of the Harlem Gas Company and that of the Knickerbocker Company, both of which are attacked in this complaint, were valid. Judge Hough did not pass upon the validity of either franchise, but held that, as the defendant owned both these franchises, it had all the authority which it required for the occupation of the city streets; and he valued these franchises at $12,000,000.

COVENTRY CORPORATION WATER SUPPLY.

Reports of the Water Committee and the Engineer.

In their report upon the working of the water undertaking of the Coventry Corporation, in the year ending March 31, the Water Committee state that the receipts from rents amounted to £19,409, against £18,243 in the preceding twelve months. This figure is the highest in the history of the undertaking. The expenses amounted to £8154, which is a decrease of £1962. The balance of revenue over working expenses is £11,414, to which must be added the bank interest (£174); making a total of £11,588. The capital charges amount to £5183; leaving a net profit of £6405, against £3225 this time last year. The unappropriated cash balance on the 31st of March was £8634. The Committee recommend that £4500 of the balance should be paid over to the borough fund in equal portions in aid of the next two borough rates. The Water Engineer (Mr. J. E. Swindlehurst), who is also the City Engineer and Surveyor, states that during the year a process of reorganization in regard to the Water Department generally was in progress, on the basis suggested by him; and, owing to the time and unremitting attention given by the Committee, much has been accomplished in this direction. New regulations for the guidance of persons carrying out works in connection with the department have been framed, and have received the approval of the Sub-Committee, as well as that of the Master Plumbers' and Master Builders' Associations, and of the Operative Plumbers' Association, in conference. The standardization and testing of all water-fittings has been agreed upon, and it will be put into practical operation so soon as the necessary buildings are erected. The whole of the mains, valves, hydrants, &c., have been investigated, and the positions noted. During the financial year 697,847,000 gallons of water were pumped and distributed. This volume represents a daily average consumption of 1,911,910 gallons for all purposes. Based on the estimated population served (89,200), the consumption is at the rate of 21·43 gallons per head. Much progress was made in connection with the house-to-house inspection of fittings, in conjunction with night inspection by the Deacon waste-meter system. In the twelve months, new mains were laid to the extent of 6350 yards, or 3·6 miles. On the 31st of March, 20,407 houses were connected to the mains—an increase of 761 houses, or 3¾ per cent. At the same date, 414 meters for trade supplies were connected—an increase of 22, or 5½ per cent. There was a considerable reduction of expenditure under various heads in the course of the year.

At the meeting of the City Council last Tuesday, the success attending the reorganization of the Water Department formed the subject of hearty congratulation when the Chairman of the Water Committee (Alderman A. H. Drinkwater) presented their annual report. He remarked that they had had a record year; there being a larger revenue than before, and the amount to be handed over in relief of the rates being higher than any previous contribution. The water-rents reached £19,409, against £18,242 for the preceding year—an increase of £1167, or 6½ per cent. This was due to an increased number of consumers and to an augmented revenue for meter supplies, which amounted to £623. The gross revenue was £19,568. On the debit side there was an expenditure of £8154 for general charges; leaving a balance of £11,414, *plus* £174 for bank interest—making together a sum of £11,588 to be carried to the profit and loss account. From this, £5183 had to be deducted for interest and sinking fund; leaving a net profit for the year of £6405—a figure considerably greater than that for any previous year. The Committee proposed to transfer to the borough fund £4500 in aid of the rates, leaving £1905, to be carried forward. Though there had been an increase of nearly 800 in the number of houses to be supplied, the expenditure on wages, coal, upkeep, &c., was 19½ per cent. less last year than in the preceding twelve months. The cost of inspectors, enginemen, stokers, &c., for wages was lower by £634. This had not been brought about by any cutting down of wages, but was entirely due to the reorganization carried out by the City Engineer, who was also the Water Engineer. There had likewise been a reduction of £225 in the cost of coal, notwithstanding the fact that the average price was 1s. 1½d. per ton higher. This had been effected by the altered system of pumping, and was a saving which they had every confidence would be permanent in the future. Their reorganization was now complete, and this would enable the Committee to bring in the new water regulations, with all their far-reaching effects, which they had no doubt would make for still greater efficiency as well as increased public convenience. Good progress had been made with the construction of the new main for affording the city a supply of water from Shustoke. The Council adopted the report with complete unanimity.

WATER SUPPLY OF SAXMUNDHAM.

An Offer to take over the Scheme.

The Saxmundham Urban District Council, at their last meeting, had before them an offer by Messrs. Preston and Co. to take over the water supply, complete it, and relieve the town from all responsibility. In explanation, it may be mentioned that about four years ago the Council carried out some experimental boring, at a cost of over £500; and a provisional agreement for the purchase of the land, at a further cost of £150, was entered into with the Chairman (Colonel H. Abdy Collins). The experiment turned out a success; but, on application being made to the Local Government Board for a loan to carry out the work, the Board refused to grant it unless a sewerage scheme was put in hand at the same time. This would have entailed an estimated total expenditure of between £10,000 and £12,000, which was thought to be a burden the town would be unable to bear. No further action was therefore taken, and the matter has since been left entirely in abeyance.

The suggestion made by Messrs. Preston was to refund the money spent on boring for the water (£523 15s.), the cost of analysis £8 8s., and the price of the land £150—total £682 3s. They submitted a scale of charges, and offered to supply water free for fire-extinguishing purposes; and for street watering and flushing drains to charge 1s. 9d. per 1000 gallons, and supply and put in six hydrants free. The Council also had before them a letter from the Chairman desiring the Council to carry out their contract to purchase from him the site for the water supply without delay. The letter stated that it was practically more than four years ago since a provisional agreement was entered into by the Council; and the matter could not be left to go on indefinitely. He was reluctantly compelled to give the Council six months' notice either to carry out the contract or give up the land and remove their property therefrom.

Some little discussion took place; and further consideration of the matter was then adjourned for a month.

The Burden of Electricity at Newport.—Referring to electrical affairs at Newport (Mon.), the "Western Mail" says: "On the first blush it looked as though Newport were lucky in having made a profit of £2600 on its electric tramways concern for the year just ended. But though this was the amount reported to the Committee as having been the credit balance, it has been found that the depreciation, which has been fixed at a sum of £3000 a year, must be met before profits can be said to be in relief of the rates. The tramways have not, therefore, quite made up all the burden of responsibility that they are expected to bear without being a charge upon the general funds of the town. With reference to the other electrical business run by the Corporation—viz., light and power—it is reported that the net deficit is £1043, which requires that a rate of ¾d. in the pound must be allocated to meet the loss. The deficit is stated to be due to the high prices of coal ruling during the year; but beyond this it seems certain that the Committee made a mistake some years ago in lowering the price of current."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

After more than three weary years of litigation, the Edinburgh and Leith Gas Commissioners have been able to come to terms with Messrs. James Muir and Son, Limited, in regard to the pollution by tarry matter of the wells which supply the pursuers' brewery with water for brewing. As some of the earlier stages in the procedure may not be fresh in the minds of readers, I may recount them. The manufacture of gas in the New Street works of the Commissioners ceased in April, 1904. In July it was discovered that the water in the "Stable" well in the brewery was contaminated by tarry matter, which, it was assumed, had its source in the old gas-works. The Commissioners declined to accept this view. In their opinion, it was most improbable that, there having been no contamination during the eighty years in which gas was manufactured there, it should appear after the works were closed. Having failed to come to terms, Messrs. Muir instituted an action in the Court of Session, in February, 1905, in which they concluded for £10,000 damages, and for penalties for continuing damage; but the second claim was given up. The case went to proof; and after a very full hearing Lord Ardwall gave decree for £3730 and expenses. This decision, however, did not rest on any of the grounds put forward by the pursuers; and the Commissioners accordingly, when they reclaimed to the Inner House of the Court, asked for further proof, in order to meet the new case the Lord Ordinary had created. They obtained an order for proof, in the preparation for which they set about sinking a well inside the gas-works and driving mines to the north and south, in order to intercept any polluting streams of tar there might be in the strata. These operations delayed the hearing of the case in the Inner House till May, 1907; and then, the Commissioners having no further evidence to lead than the result of their investigation, but admitting liability, the case was heard, and the Judges affirmed the decision, with further expenses. A month later, Messrs. Muir brought their second action, in which they sued for £15,000 as damages for the pollution of their other well, named the "Brewery" well. The Commissioners again admitted liability, but pleaded that the remedial measures they had taken would soon purify the strata in which the tar was lodged; and that the sum sued for was excessive. About the time the second action was raised, the Commissioners had, in the course of the dismantling of their works, discovered that tarry matter had escaped from two tanks situated at the north-west corner of their ground, in one of which there had been a carburetted water-gas holder, and in the other of which coal-tar had been stored. The escape of tarry matter through cast-iron tanks was inexplicable, but that it had escaped was evident. The tar in the immediate neighbourhood was cleared away, and means were taken to wash down such portion of it as had got into the strata leading to the brewery wells. This work is still going on. The Commissioners, believing that the pollution in the wells had greatly abated, if not entirely ceased, in February last applied to the Court to be allowed to thoroughly clean out the existing pollution in the "Brewery" well, after which continuing observations would show whether or not there was anything still coming in. Lord Johnston refused to allow anyone to clean out the well except the owners; but he directed that it be cleaned out to the satisfaction of Mr. D. A. Stevenson, C.E., of Edinburgh, whom he appointed as a neutral party; and he fixed the proof for June 23. The well was certified by Mr. Stevenson as having been cleaned. At the proof this week evidence was led by the pursuers, to the effect that pollution continued to come in, in less degree at times, but still in some degree. On the eve of the proof, the pursuers indicated their willingness to consider an offer of £5000 and expenses; but Counsel for the Commissioners would not recommend the increase of their judicial tender of £4000. The proof went on accordingly; but it was evident that the case was not being fought by the Commissioners in a hopeful spirit. Their object was to secure, if possible, a mitigation of damages, and to get a decision which would free them from further claims by the same parties. In short, they sought a final settlement, which would give them freedom from continuing damages. The proof, I am told, was costing £300 a day. Expenses were mounting up, which someone would have to pay; and as the evidence for the pursuers was not very encouraging to the Commissioners, on the morning of the third day they increased their offer to £4600. This sum was accepted by the pursuers, who also agreed to the defenders' conditions; and the case came to an end. The two wells are to be pumped regularly, so as to draw any tarry matter which may be in their neighbourhood into them, and have it taken away, with the view, in the interests of the pursuers, of having the strata cleaned at as early a date as possible, and in the interests of the Commissioners of preventing the pollution flowing past the wells, and perhaps reaching other properties. If pumping should cease, the Commissioners have power to fill up the well or wells with coke dust and breeze, by which it is hoped to catch any tarry matter coming in; and, if necessary, to empty and refill the well or wells. There is an expectation that, by the measures taken, along with the maintaining of a head of water—probably with something dissolved in it—in the tanks at the top of the strata, from which the pollution has emanated, the tar will ultimately be got rid of. It is a great problem whether it will, at least for many a long day. In a fissured stratum of sandstone, tar is a slow mover. It is not known when the first impregnation took place; but the first appearance of tar in the "Stable" well was more than a year after the making of gas ceased at New Street. The distance between the tar-tanks and the "Stable" well is about 470 feet. The tar, therefore, flowing into the strata took more than a year to travel 470 feet. But it took a year-and-a-half longer to reach the "Brewery" well, which is about the same distance from the tar-tanks, and 150 feet from the "Stable" well. Lord Ardwall allowed ten years for the "Stable" well to be clear of tar. The witnesses for the pursuers this week would not bind themselves to ten years, or any period. This was natural, as the policy of the pursuers was to seek compensation as for a complete stoppage of the brewery—they to retain the brewery. This was a condition which it was scarcely to be expected they would get; and they have not got it. The terms they have secured will, on Lord Ardwall's calculation, carry them on for about ten years. Between this and then many things may happen. For one thing, there is the possibility of the wells becoming clean at an earlier period, of which the pursuers will have the advantage. On the side of the Gas Commissioners, they have got out of a situation which has been extremely troublesome and vexatious. There will be no more claims in respect of the Calton Hill Brewery.

At the annual meeting of the Carluke Gas Company, Limited, on Tuesday, it was reported that the income for the year had been £3155, and the expenditure £2235; the profit being £920. A dividend of 2s., with a bonus of 6d. per share, was declared, and the balance of £294 was carried forward.

The annual meeting of the Kinross and Milnathort Gaslight Company, Limited, was held on Monday. A dividend of 7½ per cent. was declared. It was agreed to write off £92 as depreciation on buildings and plant, and to reduce the price of gas by 2½d. per 1000 cubic feet; making it 4s. 2d. for lighting, and 3s. 11½d. for cooking.

The Kelso Gas Company held their annual meeting on Thursday. The prices of gas were continued at 3s. 4d. per 1000 cubic feet to ordinary consumers for lighting, 2s. 10d. for gas used in public lamps, and 2s. 6d. for power purposes. A dividend of 10 per cent. was declared. A resolution was adopted, agreeing to some alterations of the Deed of Constitution of the Company, with a view to facilitate a proposal to reconstruct the Company with limited liability.

The Directors of the Cupar Gas Company, Limited, have agreed to recommend that the price of gas be reduced by 2½d. per 1000 cubic feet, and that the dividend be the same as last year—35s. per share.

The Water Committee of the Glasgow Town Council had before them this week a report by a Sub-Committee regarding the supply of water for domestic purposes in the high districts of Maryhill, Springburn, and Cowlairs. The Town Clerk advised the Sub-Committee that, by the Act of 1865, the Corporation are not bound to give a supply of water to houses on high levels to which water cannot be raised by means of the existing reservoirs and works; but that, if an intermittent supply can be given, they are, when practicable, to give such supply on the owners or occupiers providing and maintaining, at their own expense, suitable cisterns and apparatus. The houses in the districts mentioned can only be given an intermittent supply. The Sub-Committee were of opinion: (*a*) That the defects complained of in the districts mentioned are due either to the absence or inadequacy of storage accommodation; (*b*) that the Water Committee are carrying out the obligations imposed upon them by the Water Acts; (*c*) that any defective supply cannot be attributed to the want of pressure, as the water supplied by the Corporation is being constantly laid on at the highest pressure which can be obtained from the existing reservoirs and works; (*d*) that the remedy for the state of matters complained of rests with the landlords or factors of the respective properties, and is to some extent in the hands of the tenants themselves; and (*e*) that in these circumstances it was unnecessary to make any recommendations on the subject. The Water Committee adopted this report, with the exception of the last clause, for which they substituted a recommendation that statutory power be obtained to compel owners to provide and maintain suitable cistern accommodation, and failing their doing so, to authorize the Corporation to do the work and to recover the cost from the defaulters.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 27.*

Sulphate of Ammonia.

The market has again been extremely dull, and makers have only been able to effect sales by further reductions in prices. There have been very few fresh orders, and requirements for covering June contracts have not been sufficient in bulk to check the downward movement. The closing quotations are, consequently, £11 10s. to £11 11s. 3d. per ton f.o.b. Hull, £11 12s. 6d. to £11 13s. 9d. per ton f.o.b. Liverpool, and £11 15s. to £11 17s. 6d. per ton f.o.b. Leith. The forward position is also weaker; and at the close the views of buyers for July-December and October-March are hardly on the level of spot prices. Producers have modified their ideas, but not sufficiently to tempt buyers.

Nitrate of Soda.

This article is very quiet in all positions, and the spot quotations are 9s. 9d. and 10s. per cwt. for 95 per cent. and refined qualities respectively.

LONDON, *June 29.*

Tar Products.

The markets for tar products continue quiet, and there is little alteration in prices. Pitch remains weak. For forward delivery, consumers appear to be well covered for a considerable time ahead. Creosote is firm, but prices remain the same. Benzol, 90 per cent., is easier; business having been reported at 7¾d. Fifty-ninety benzol and toluol are unchanged, and there is very little demand for either article. Solvent naphtha continues steady without any alteration in price. High-flash naphtha is quiet, but there is not very much demand for this article. Carbolic acid remains weak for both prompt and forward delivery. Refined naphthalene is unchanged; but crude naphthalene continues firm, owing to the demand for creosote.

The average values during the week were: Tar, 11s. 6d. to 15s. 6d., *ex* works. Pitch, London, 19s. 6d. to 20s.; east coast, 18s. to 18s. 6d.; west coast, 17s. 6d. to 18s. 6d., f.a.s. Benzol, 90 per cent., casks included, London 7¼d. to 7⅜d., North 7¼d. to 7⅜d.; 50-90 per cent., casks included, London 7¼d., North 7d. to 7¼d. Toluol, casks included, London 8d., North 7¼d. to 7⅜d. Crude naphtha, in bulk, London 3½d. to 3⅝d., North 3¼d. to 3½d.; solvent naphtha, casks included, London 10d. to 10¼d., North 9d. to 9½d.; heavy naphtha, casks included, London 9⅜d. to 10¼d., North 8¾d. to 9¼d. Creosote, in bulk, London 2⅜d. to 2½d., North 2¼d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast 1s. 5½d. to 1s. 6d., west coast 1s. 5½d. Naphthalene, £4 10s. to £8 10s.; salts, 35s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article continues weak. The principal London Gas Companies quote £12; while the outside makes can be bought on Beckton terms at £11 10s. In Hull, £11 10s. to £11 12s. 6d. is about the price, and £11 12s. 6d. to £11 13s. 9d. in Liverpool. In Leith, it is doubtful whether anything over £11 17s. 6d. can be obtained, and no business is reported at £12. The prices asked by makers are too high to permit of business.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Coal and cannel contracts are being somewhat freely concluded just now with gas undertakings, on the lines previously quoted of 6d. below last year's figures. Engine fuel is in less request; and there is not much slack on the market. Shipping is quieter. There is very little doing in furnace coke. There is no change to record in average prices, which at the pits are as follows: Best house coal 15s. to 16s. 6d., secondary 14s. to 15s., common 12s. to 13s. 6d., burgy 10s. 6d. to 11s. 4d., best slack 9s. 6d. to 10s. 4d., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. to 14s. 6d. f.o.t. at Garston, and furnace coke 19s. to 24s.

Northern Coal Trade.

The effect of local holidays has been to make the northern coal trade irregular in production, and with some variation in the prices of fuel, according to the position of the collieries. In steam coals, the demand has been steady generally, and best Northumbrian steams have been from 13s. to 13s. 3d. per ton f.o.b. For second-class steams, the quotation is from about 11s. 9d. to 12s. 3d.; and steam smalls are steadier at from about 5s. 9d. to 7s. At the gas coal collieries, the work is steady, with a good output, which is well taken up for this season—the heavy exports making up for the normally low local consumption at this season of the year. Durham gas coals are being quoted, according to quality, from about 10s. to 11s. per ton f.o.b. for the usual kinds, and from 11s. 9d. to 12s. for "special" sorts. In contracts, some for Genoa have been closed at from 15s. 10d. to 16s. 6d., delivered at that port; and those, for about 12,000 tons, for Torquay are also believed to be settled, but the details and price are not yet known.

Scotch Coal Trade.

Shipping continues active, with a demand suitable to the season of the year. Home trade is not very encouraging; there being an increasing accumulation of stocks at the collieries. Prices are quoted: Ell 10s. 6d. to 12s. 6d. per ton f.o.b. Glasgow, splint 10s. 9d. to 11s., and steam 10s. 3d. to 10s. 6d. The shipments for the week amounted to 314,461 tons—an increase of 30,399 tons upon the preceding week, and of 2859 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,254,788 tons—a decrease of 428,139 tons upon the corresponding period of 1907.

Edinburgh and Leith Gas Accounts.

The annual accounts of the Edinburgh and Leith Gas Commission submitted yesterday showed the balance carried to the profit and loss account to be £103,007, and the free balance after meeting all charges, and providing £6559 to meet the claims under the head of "accidental damages," including the Brewery Well case, to amount to £4436. The quantity of gas sold during the year was 8 million cubic feet greater than for the preceding twelve months. The revenue from gas was higher by £16,232, and from residues by £9536.

British Air Gas Company, Limited.—Capital £100, in £1 shares. To carry on the business of manufacturers of air and acetylene gas, dealers in lamps and gas-generators, &c. No initial public issue. Registered without articles of association. The first Directors are H. E. Baker, N. Webster, and W. H. Fielding. Registered office, No. 49, Victoria Street, Westminster.

Sales of Gas Shares.—At a local auction sale last Tuesday, 2000 new £1 five per cent. preference shares in the Melton Mowbray Gas Company were disposed of at from £1 2s. to £1 3s. 6d. each. The money is required for an extension of the mains to Asfordby. At Wellingborough, last Thursday, 13 "C" shares (£10) in the Wellingborough Gas Company realized £22 and £22 2s. each; while 10 £5 shares in the Finedon Gas Company fetched £8 3s. 6d. each.

Carbon Monoxide Poisoning and Workmen's Compensation.—An application by the widow of a labourer formerly employed by the Minehead Electric Supply Company recently came before Judge Beresford at the Taunton County Court. The allegation was that the man, who was named James Escott, died from carbon monoxide poisoning in the course of his employment; and the widow claimed £156. There is a gas-producer at the electric station; and plaintiff's case was that there being no proper means provided for carrying away the fumes, carbon monoxide accumulated gradually in the deceased's system by inhalation extending over a long period, leading to his death, which was certified as being due to "carbon monoxide poisoning and hemorrhage." For the Company, it was submitted that it had not been shown that death was occasioned by any disease scheduled under the Statute. The doctor's opinion was that it was quite impossible to fix any date on which deceased was poisoned; and carbon monoxide was not mentioned in the schedule. The contention on behalf of the plaintiff in reply to this was that carbon monoxide might be classed with carbon bisulphide, which was scheduled. The Judge said he would like to have a medical opinion as to whether carbon monoxide might be classed with carbon bisulphide. He was sorry for the widow; but he was afraid he must decide against her. Ultimately it was agreed that the matter should stand over until the next Court; and if in the meantime it was ascertained from a chemist that carbon monoxide did not come within the schedule, the plaintiff would accept the Judge's decision.

ANOTHER "BLAND" SUCCESS.

6000 "BLAND" BURNERS FIXED—"The Universal reply is, Satisfaction."

Mr. J. D. ASHWORTH, M.I.Mech.E., Engineer and General Manager, Portsmouth Gas Company, writes:—

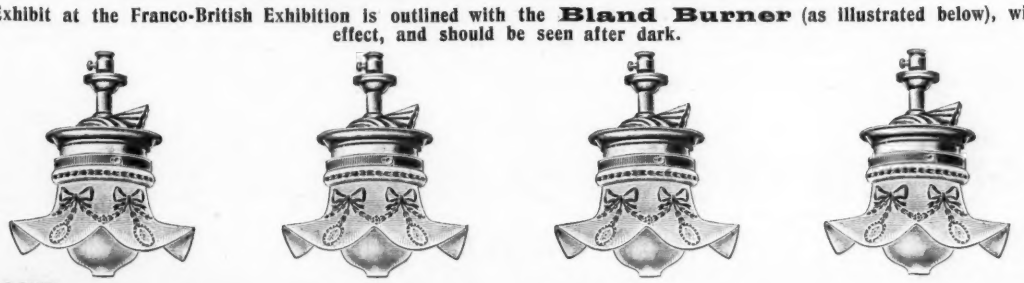
"We have about 6000 'Bland' Burners fixed in this Town, in use in Factories, Shops, Churches, and Private Houses, and the universal reply is, 'Satisfaction.' The general appearance of the Burner is good, and lends itself to almost any style of decoration."

"We have tested the Burners under various conditions, and find that an exceedingly good light is maintained with a small consumption of Gas, while the maintenance proves itself to be exceptionally low."

June 3rd, 1908. J. D. Ashworth

THE FRANCO-BRITISH EXHIBITION.

The Gas Exhibit at the Franco-British Exhibition is outlined with the Bland Burner (as illustrated below), with great effect, and should be seen after dark.



THE BLAND LIGHT SYNDICATE, LTD., Show-Rooms: 63, Queen Victoria St., London, E.C.; 20, Fennel St., Manchester.

Municipal Gas-Works in Sicily.

A British Consular report on the Trade of Sicily for 1907, which has just been issued by the Foreign Office, states that the Civic Council of Palermo promised, with a view to popularizing a scheme for a municipal gas-works, that if the electorate agreed to accept the undertaking, the Municipality would remove a recently imposed tax on house-rents as well as lower the cost of gas to its clients. After the Municipality had taken over the existing gas-works, by purchase, it discovered that its calculations scarcely justified the revenue which it had anticipated from the enterprise. Coal was going up in price; the works were old; considerable expansion of the city limits had increased the demand for gas lighting; and the old mains were inadequate to the requirements. Various expedients were tried; but, nevertheless, the Municipality found itself face to face with a situation which had to be remedied at once. Beside the other difficulties, the men employed at the gas-works, as well as the lamp-lighters, clamoured for improved pay and treatment. The Civic Council lowered the price of gas by 0·2d. per cubic metre, and allowed the men an all-round increase of pay. This amounted to an annual loss of about £12,000. Notwithstanding all this, and the fact that the Municipality charges itself only cost price for gas for public purposes, it is estimated that this year the profits will be about £16,000. No provision has been made for a reserve fund, against fluctuations in the cost of coal; for deterioration of plant, renewals, relaying of mains, expansion, &c.; nor for unforeseen expenses and pensions.

Automatic Lighters at Tottenham.—The Tottenham and Edmonton Gas Company have written to the Tottenham Urban District Council offering to make a reduction of 2s. per lamp throughout the parish in the charge for lighting, if the Council consent to the general adoption of automatic lighting, experiments in regard to which have lately been carried out. A Committee are to consider the matter.

Stafford Corporation Gas Accounts.—The results of the past year's working of the Stafford Corporation gas undertaking were given in the "JOURNAL" for the 9th inst. (p. 645); but what was there stated may now be supplemented by a few figures from the analysis of the Engineer and Manager (Mr. Hubert Pooley). The coal carbonized and the coal equivalent of oil and coke used in the manufacture of carburetted water gas in the past twelve months was 17,739 tons; the make of gas being 197,765,000 cubic feet, or 11,149 feet per ton. The average illuminating power of the gas supplied was 16·48 sperm candles; and the proportion unaccounted for was no more than 2·15 per cent. The quantity of coke (less breeze) made per ton of coal carbonized was 12¼ cwt., and the amount sold 9·52 cwt. The average price at the works per ton of coke sold was 11s. 11d. Of tar, 1008 tons were made; and the amount sold (at 25s. 5d. per ton) per ton of coal carbonized was 12 gallons. There were 197 tons 12 cwt. of sulphate of ammonia manufactured; the amount sold per ton of coal carbonized being 25·1 lbs. The net proceeds of the residuals equalled 88·7 per cent. of the cost of the coal.

Water Supply of Mansfield.—The foundation stones in connection with a further water supply scheme for Mansfield were laid last Tuesday by Mr. Wallis, the Mayor, and Alderman Alcock, the Chairman of the Water Committee. The site of the new works, on which a sum of about £26,000 is to be spent, is at Clipstone, 4 miles from Mansfield. At present the town depends for its water on works situated at Rainworth; but the rapid growth of the population of late years has rendered advisable the provision of a further supply.

Public Lighting of Guisborough.—After considering terms submitted for the public lighting of Guisborough by electricity, the Urban District Council have agreed to accept the offer of the Gas Company. The Company will provide incandescent lamps of 75-candle power, for a season of nine months, at a cost of £1 19s. 6d. each; the lamps hitherto used, with flat-flame burners, and for a season of only eight months, cost £1 7s. 9d. each. Edgar's "Caxton" street-lanterns are to be used, fitted with patent anti-friction double roller traps.

Wallasey Gas-Works Extensions.—On Dr. A. W. Brightmore, of the Local Government Board, attending last Tuesday at Egremont, to inquire into an application by the Wallasey Urban District Council for sanction to borrow £26,933 for gas-works extensions, the Clerk (Mr. H. W. Cook) said he found there was a division of opinion among the members of the Committee as to the amount of money to be applied for; and as he would require instructions on this point, he asked the Inspector to adjourn the inquiry until July 21, when he hoped to come before him with a complete statement, and have the unanimous support of the Council and the Committee. Mr. W. Eastwood (Chairman of the Gas and Water Committee) also stated that it was the wish of the Committee that the inquiry should be adjourned for a month. Mr. S. S. Dawson said it was only a question of finance between the Gas and Finance Committees. As Chairman of the Finance Committee, he approved of the adjournment. The Inspector agreed to adjourn the inquiry until July 21.

Reductions in Price.—The Harrogate Gas Company will reduce the price of gas 2d. per 1000 cubic feet as from July 1, bringing down the gross charge to 2s. 8d. per 1000 feet. The Southborough Urban District Council have decided to make a rebate of 2d. per 1000 cubic feet to consumers of 2500 feet of gas per quarter. The Directors of the Uxbridge Gas Company have announced a reduction, as from the Midsummer meter readings, of 2d. per 1000 cubic feet (from 3s. 9d. to 3s. 7d.) in the price of gas for all purposes; special discounts being allowed off the reduced rate, of 10 per cent. for gas used for cooking and heating, and of 15 and 25 per cent., according to consumption, for that employed for motive power. Users of prepayment meters will be allowed a rebate of 1d. on every 1s. 3d. (instead of 2s. 6d.) found in the cash-box. In conjunction with the notification of this reduction, the Company are calling the attention of the consumers to the fact that visitors to the Franco-British Exhibition will find in the Machinery Hall an exhibit by the associated gas undertakings of the country, showing the most modern applications of gas for domestic purposes.

"CANNON"
ADS. No. 1.

BULL'S EYES.

PAST.—(1) We introduced **loose Fronts and Bricks** for Gas-Fires (see Patent).
(2) We introduced **Side Bridges** for Cookers.
(3) We introduced the Air and Gas Regulator.
(4) Our Bachelor Griller (Fig. 2281) is now being followed by our competitors.
(5) We were the Pioneers of **loose Hot Plates** in the form of Hinged Top Bars or Racks.
(6) We are the Sole Owners of "Porceliron."

PRESENT. FUTURE—Engaged on something "revolutionary," which the will disclose (see our future ADS.).

CANNON IRON FOUNDRIES, LIMITED,
18, HOLBORN VIADUCT, LONDON, E.C.
Works: DEEPFIELDS, near BILSTON, STAFFS.

Metropolitan Water Board and their Districts.—The Thames Conservancy Board have adopted the recommendation of the Lower River Committee that application be made to the High Court for a declaration that the Metropolitan Water Board are not entitled to supply excess water taken under the provisions of the Southwark and Vauxhall Water Act, 1898, outside the district formerly served by that Company except under the direction of the Local Government Board, and for an injunction accordingly. It had been reported that the Water Board had taken a quantity of excess water through the intakes of the Southwark and Vauxhall district, and supplied it to the New River and Lambeth districts.

The Dangers of Electricity.—The most historic building in Lanarkshire, and one of the oldest baronial homes in Scotland ("Douglas Support," Coatbridge, the residence of the Rev. Sholto Douglas, brother and heir of Lord Blythswood) was destroyed by fire last Saturday morning, owing, it is supposed, to the fusing of an electric wire, as no fires were in use. Early the same morning, the Accrington Hippodrome was totally destroyed by fire, which is believed to have originated from an electric fuse. Probably from the same cause, the electrician's room at the Savoy Theatre, as well as some scenery, was seriously damaged by a fire which broke out shortly after the employees had left on Saturday night.

Suicide by Gas Poisoning.—An inquest was held at Ilfracombe on Wednesday, on Mary Ann Billett, aged 53, wife of the steward of the Constitutional Club. It was stated that the woman got up early on that morning, and was subsequently discovered by her husband dead in a chair in the kitchen, with the taps of the gas-stove turned full on. A verdict was returned of "Suicide while temporarily insane."

Birkenhead Gas and Water Supply.—The accounts of the Birkenhead Corporation Gas Committee for the year to March 31 showed a gross profit, including amounts transferred from the reduction of price account, of £44,305. After providing for the interest and sinking fund charges for the year (£15,258), and a sum of £1154 for income-tax on profits, and transferring £5000 to the renewals fund, there remained a divisible profit of £23,271. Of this, £11,635 was credited to the borough fund, as compared with £11,049 for the year 1906-7. The debt outstanding at March 31 was £300,655. The water-works showed a gross profit of £15,039. The sum required for interest, sinking fund, and income-tax charges was £8980, and £3000 was added to the renewals fund, which now amounts to £9783. Of the remaining balance, £3000 has been applied towards the expenses of the new Water Act, and £241 carried forward to next year on revenue account. The capital expenditure during the year was £5134; and the amount of debt unredeemed is £188,745.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.
AGENT (INCANDESCENT MANTLES). B.A. 1780, Agence Havas, Brussels.

Situations, &c., Wanted.
DRAUGHTSMAN. "A.K.," c/o Street's.
GAS-STOVE TRADE. No. 4960.
SECRETARYSHIP. A. L. Griffith, 46, Queen Victoria Street. E.C.
TRAVELLER. No. 4958.
GAS FITTER, &c. "Gas Fitter," Boscombe.

City and Guilds Examination.
CORRESPONDENCE CLASSES. Correspondence College Company.

Plant (Second-Hand), &c., for Sale.
COMPLETE GAS-WORKS PLANT. Nelson Gas Department.
RETORT-HOUSE FITTINGS, PURIFIERS, EXHAUSTERS, WASHERS, &c. Hastings and St. Leonards Gas Company.
WASHING EJECTOR BOXES (WATER-WORKS), &c. No. 4959.

Plant (Second-Hand), &c., Wanted.
BRIDGE PIPES. Malton Gas-Works.

Company Meetings.
EUROPEAN GAS COMPANY. London Offices. July 14. 2.30 o'clock.
IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. July 15. One o'clock.

Stocks and Shares.
HAMPTON COURT GAS COMPANY. July 16.
UXBRIDGE GAS COMPANY. July 14.

TENDERS FOR

Coal and Cannel.
BARROW-IN-FURNESS CORPORATION. Tenders by July 3.
EAST RETFORD GAS DEPARTMENT. Tenders by July 4.
HEYWOOD GAS DEPARTMENT. Tenders by July 11.
LEIGH CORPORATION. Tenders by July 17.
LITTLEBOROUGH GAS COMPANY. Tenders by July 18.

Coal and Cannel—*continued.*
LOUGHBOROUGH GAS DEPARTMENT. Tenders by July 9.
MIDDLETON CORPORATION. Tenders by July 18.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by July 17.
NORTHWICH GAS COMPANY. Tenders by July 9.
OLDBURY GAS DEPARTMENT. Tenders by July 11.
OLDHAM GAS DEPARTMENT. Tenders by July 14
TODMORDEN GAS DEPARTMENT. Tenders by July 16.

Coke.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by July 17.

Tar and Liquor.
LITTLEBOROUGH GAS COMPANY. Tenders by July 18.
NEWCASTLE-UNDER-LYME GAS DEPARTMENT. Tenders by July 17.

Weighbridge.
SALFORD GAS DEPARTMENT. Tenders by July 8.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 925.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19—20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
310,000	Stk.	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
200,000	5	May 29	6½	Bombay, Ltd.	6—6½	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4½—4¾	..	5 9 6
50,000	10	Feb. 27	14	Bourne-mouth Gas and Water	10 p.c.	..	4 16 7
51,810	10	,,	7	B 7 p.c.	16½—16¾	..	4 3 7
53,200	10	,,	6	Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	240—245	..	5 2 1
300,000	,,	,,	9¾	Do. New	180—185	..	5 2 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	June 12	4	Do. 4 p.c. Deb.	100—103	..	3 16 2
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.	202—207	..	5 8 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	152—157	..	5 5 1
460,000	20	Mch. 27	10	British	42—43	+⅛	4 13 0
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	86—89	..	5 1 2
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	11—11¼	+¼	6 1 9
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	91—93*	..	4 6 0
150,000	20	Mch. 12	7½	Cagliari, Ltd.	24—25	..	5 16 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4—6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	5—7	..	6 8 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort,	46—48	..	6 5 0
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	88—90*	−1½	5 0 0
157,150	Stk.	Feb. 27	5	Chester 5 p.c. Ord.	111—113	..	4 8 6
1,493,280	Stk.	Mch. 12	5 5/16	Commercial 4 p.c Stk.	104—109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.	100—105	..	4 15 3
475,000	,,	June 26	3	Do. 3 p.c. Deb. Stk.	81—83*	+⅛	3 12 3
800,000	Stk.	June 12	6½	Continental Union, Ltd.	112—117	..	5 11 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk.	121—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mch. 31	5	East Hull 5 p.c. Ord.	100—103	..	4 17 1
486,090	10	Jan. 30	12	European, Ltd.	23—24	..	5 0 0
354,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,182,590	Stk.	Feb. 13	4 5/16	Gas-light and Coke	4 p.c. Ord.	−⅛	4 9 9
2,600,000	,,	,,	3½		3½ p.c. max.	..	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	3 13 5
4,193,975	,,	June 12	3		3 p.c. Con. Deb.	..	3 10 7
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.		..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.		..	5 13 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.		..	5 15 9
4,940,000	Stk.	May 14	8	Imperial Continental		..	4 7 11
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.		..	3 13 8
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c.		..	5 1 8
£			p.c.				£ s. d.
561,000	Stk.	Feb. 27	10	Liverpool United A	232—234	..	4 5 6
718,100	,,	,,	7	Do. B	165—167	..	4 3 10
306,083	,,	June 26	4	Do. Deb. Stk.	104—106*	..	3 15 6
152,736	Stk.	Feb. 13	7⅞	Maidstone 5 p.c.	136—141	..	5 8 2
75,000	5	June 26	6	Malta & Medn., Ltd.	4—4⅛*	..	6 13 4
560,000	100	Apl. 1	5	Met. of and Melbourne 5 p.c. Deb.		..	4 18 0
250,000	100	,,	4½	4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 29	3½	Monte Video, Ltd.	11—12	..	5 16 8
1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.	108—109	..	4 4 10
418,460	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	90—92	..	3 16 1
15,000	10	Feb. 27	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	140—143	..	5 11 11
60,000	5	Mch. 27	7	Ottoman, Ltd.	6—6⅛	..	5 7 8
398,490	5	Apl. 29	7	Primitiva Ord.	6—6¼	+¼	5 7 8
796,980	5	Jan. 30	5	Do. 5 p.c. Pref.	4⅞—5⅛	+⅛	4 17 7
488,900	100	June 1	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
1,000,000	10	Apl. 29	8	River Plate Ord.	13—13½	+¼	5 18 6
312,650	Stk.	June 26	4	Do. 4 p.c. Deb.	91—93*	..	4 6 0
250,000	10	Apl. 10	8	San Paulo, Ltd.	13½—14	..	5 14 4
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—52	..	4 16 2
135,000	Stk.	Mch. 12	10	Sheffield A	245—247	..	4 1 0
209,984	,,	,,	10	Do. B	245—247	..	4 1 0
523,500	,,	,,	10	Do. C	245—247	..	4 1 0
70,000	10	May 29	10	South African	14—15	..	6 13 4
6,429,895	Stk.	Feb. 13	5½	South Met., 4 p.c. Ord.	118—120	..	4 8 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
209,820	Stk	Mch. 12	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Feb. 27	5⅓	S'th Suburb'n Ord. 5 p.c.	116—119	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	122—127	..	3 18 9
502,310	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Feb. 27	6¾	Tottenham and Edmonton A 5 p.c.	120—125	..	5 8 0
398,940	,,	,,	5¾	B 3½ p.c.	106—108	+1	4 17 3
149,470	,,	June 25	4	4 p.c. Deb.	98—103*	..	3 17 8
182,380	10	June 12	8	Tuscan, Ltd.	10—10⅛	..	7 12 4
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	106—110	..	4 13 6
255,636	Stk.	Feb. 13	6¾	Wandsworth and Putney B 3½ p.c.		..	4 17 9
80,075	,,	June 26	3	3 p.c. Deb. Stk.	128—133	..	4 17 9
845,872	,,	Feb. 27	5⅛		72—77*	+½	3 17 11
185,000	,,	,,	5	West Ham 5 p.c. Ord.	100—102	..	5 0 6
228,300	,,	June 26	4	Do. 5 p.c. Pref.	120—125	..	4 0 0
				Do. 4 p.c. Deb. Stk.	100—105*	..	3 16 2

Prices marked * are "Ex div."

An Anglesey Water Scheme.—Work has just been commenced upon an extensive new water scheme which is to cost some £20,000, and will supply Holyhead and other places with water from the Traffwyll Lake. The mains will be about 10 miles in length.

Bradford Water-Works Profits.—The income of the Bradford water undertaking for the year to March 31 was £184,324; the receipts from the sale of water for domestic and trade purposes amounting to £174,700, which was an increase of £1900 on the previous year. The expenditure was £169,597, including £115,652 for interest, and £15,251 for repayment of capital borrowed through the sinking fund. There was thus a profit of £14,727, as compared with £3016 the previous year. This satisfactory state of affairs is largely due to the equation of the repayments for the debt redemption, which was sanctioned by the Local Government Board eighteen months ago. Under the old system of debt repayment, a deficit of £28,496 had grown up; but the profit of the last two years has reduced this deficit to £10,750.

The offices of the Dellwik-Fleischer Water-Gas Syndicate have been removed to No. 25, Victoria Street, Westminster, S.W.

The new retort-house now being erected, at a cost of £10,000, at the Bolton Corporation Gas-Works, is nearing completion, and is expected to be ready in August. It is claimed for it that when finished it will be the finest of its kind in the country.

The Directors of the Richmond Gas Stove and Meter Company, Limited, have declared an interim dividend for the six months ending June 30, at the rate of 6 per cent. per annum, on the cumulative preference shares, and 10 per cent. on the £1 ordinary shares.

The Brixham water-works, in connection with the Paignton moorland scheme, will be opened on July 15. The ceremony will be performed by Mrs. Layland-Barratt; and members of the Paignton Urban District Council and the other public bodies of the neighbourhood will be invited. There will be a lunch at the Town Hall.

APPLICATIONS FOR LETTERS PATENT.

12,802.—Robson, G., "Turning on and off the lights of gas-burners." June 15.

12,809.—The Otto-Hilgenstock Coke-Oven Company, Ltd., "Removing tar from the hot gases from coke-ovens, gas-retorts, or the like." A communication from Dr. C. Otto and Co., G.m.b.H. June 15.

12,833.—Bellingham, B., and Kynoch, Ltd., "Gas-engines." June 16.

12,837-8.—Main, R. B. & A. P., "Gas-regulators for bunsen burners." June 16.

12,856.—Scoby-Smith, G. E., "Gas-producers." June 16.

12,859.—Field, S. S., and Kirby, A., "Injectors or atomizers for hydrocarbons such as crude coal tar and the like." June 16.

12,875.—Lake, H. W., "Purifying apparatus." A communication from H. S. Jewell. June 16.

12,905.—Akers, G. A., C. W., & A. E., "Globe-holders for inverted burners." June 16.

12,931.—Camelinat, E. G., "Acetylene generators." June 17.

12,942.—Bertholdt, C. R., "Gas-radiator." June 17.

12,955.—Hammond, J., and Cash, J., "Manufacture of gas." June 17.

12,967.—James, G., "Combustion of gaseous fuel and apparatus therefor." June 17.

12,991.—Peck, E. C., "Gas-pendants." June 18.

12,996.—Wilson, J., "Gas-turbines." June 18.

13,088.—Siemens, Bros. & Co., Ltd., "Disc water-meters." A communication from Siemens and Halske Akt.-Ges. June 19.

13,145.—Carruthers, F. J. C., "Carburation of air." June 20.

13,163.—Doak, J., "Folding gas-cooking attachments." June 20.

13,200.—Dingler, H., "Making combustible gas." June 20.

13,204.—Drehschmidt, H., "Burning off mantles." June 20.

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See illustrated advertisement, June 23, p. V. of Centre

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

[Registered as a Newspaper.

Vol. CII. No. 2355.] LONDON, JUNE 30, 1908. [60th Year. Price 6d.

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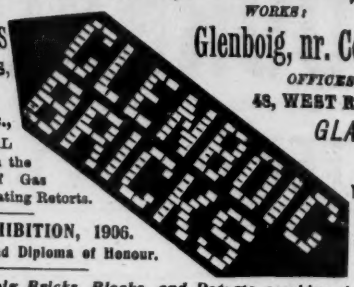

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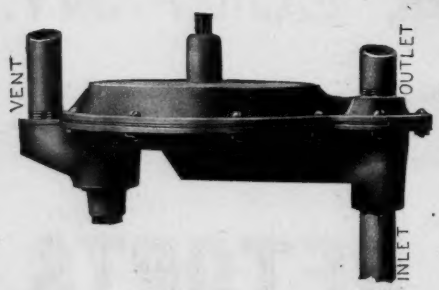

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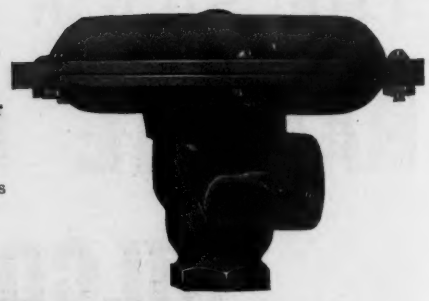

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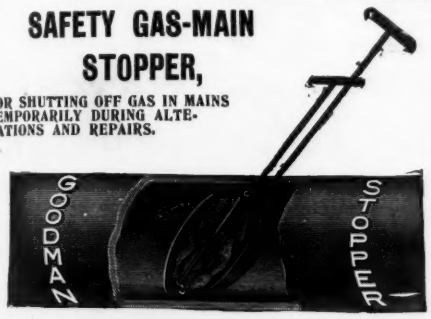

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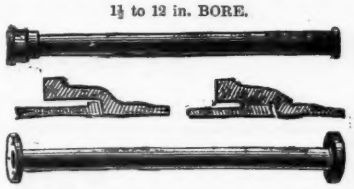

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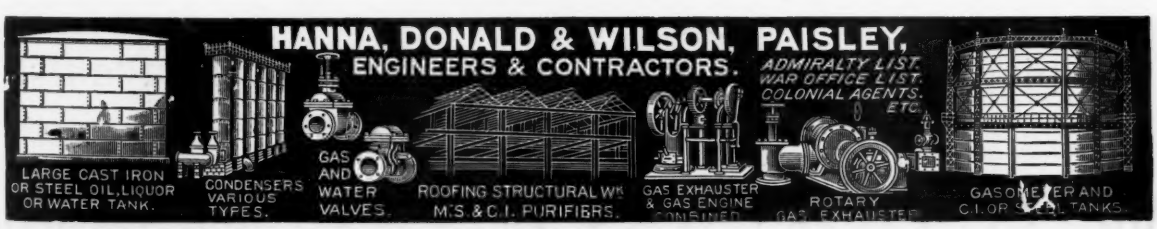
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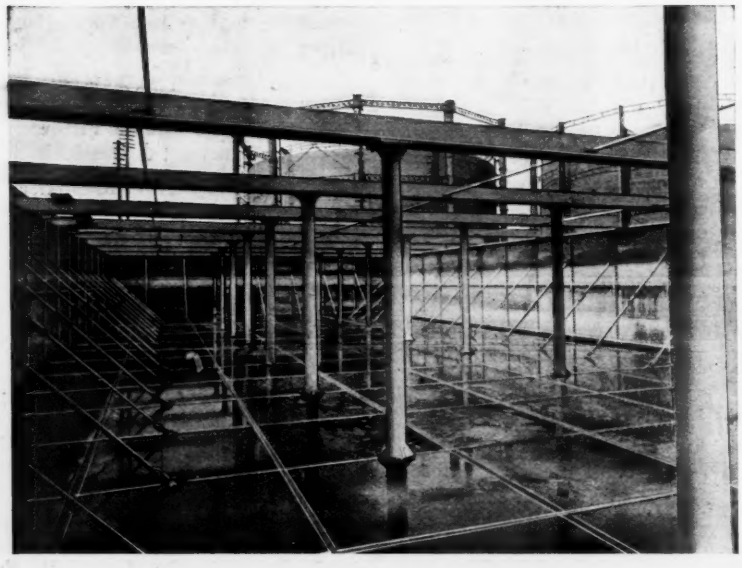

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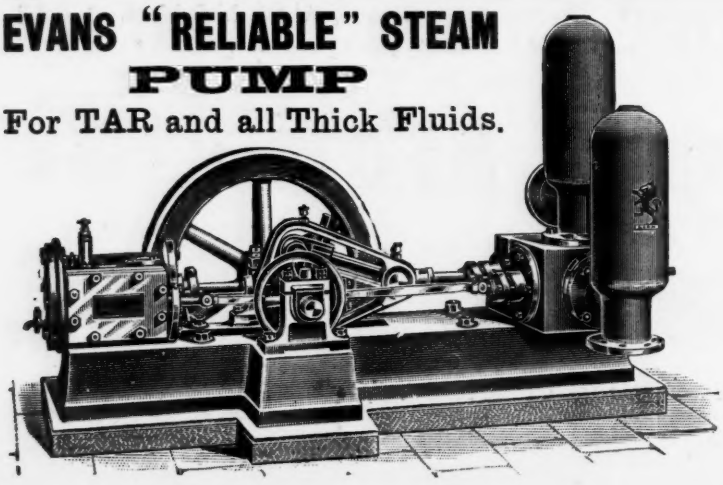

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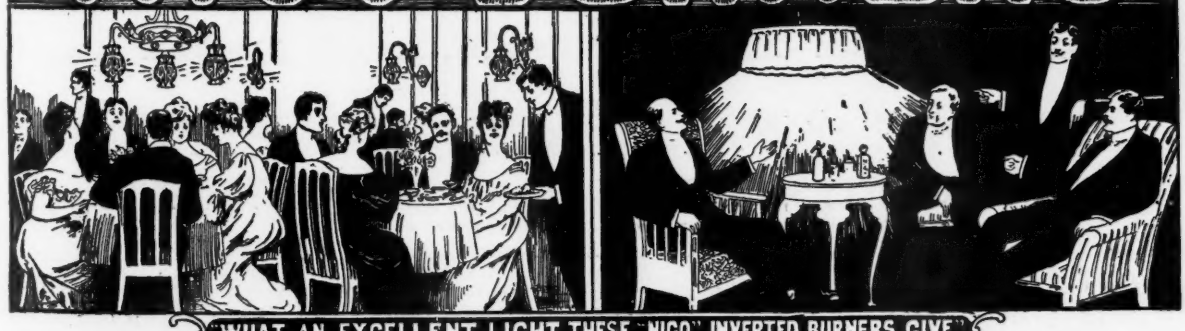

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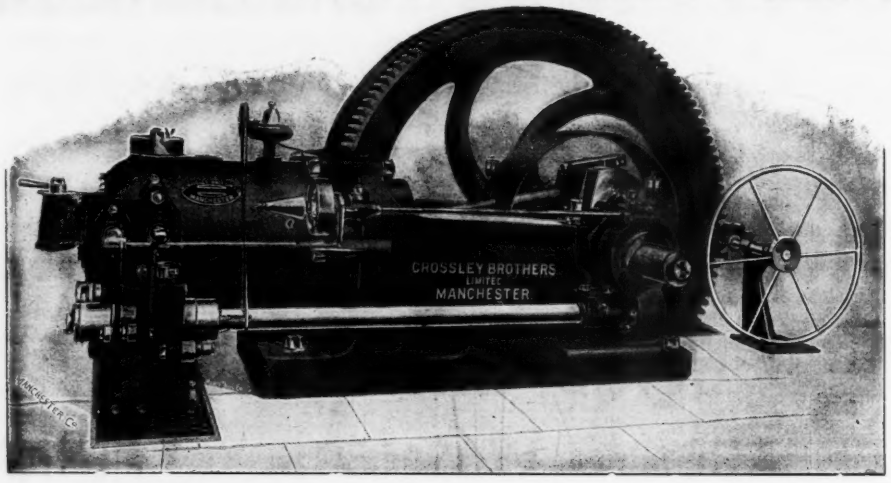

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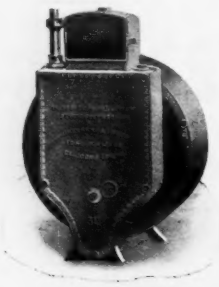

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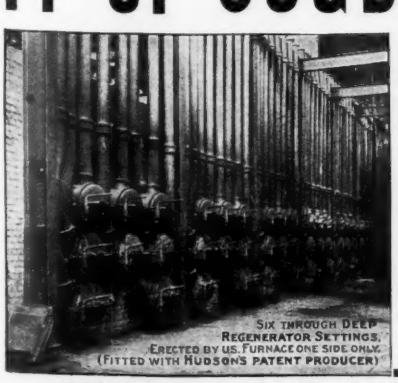
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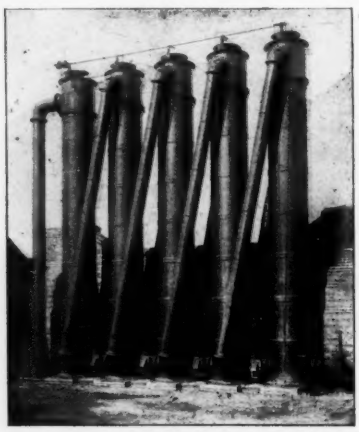

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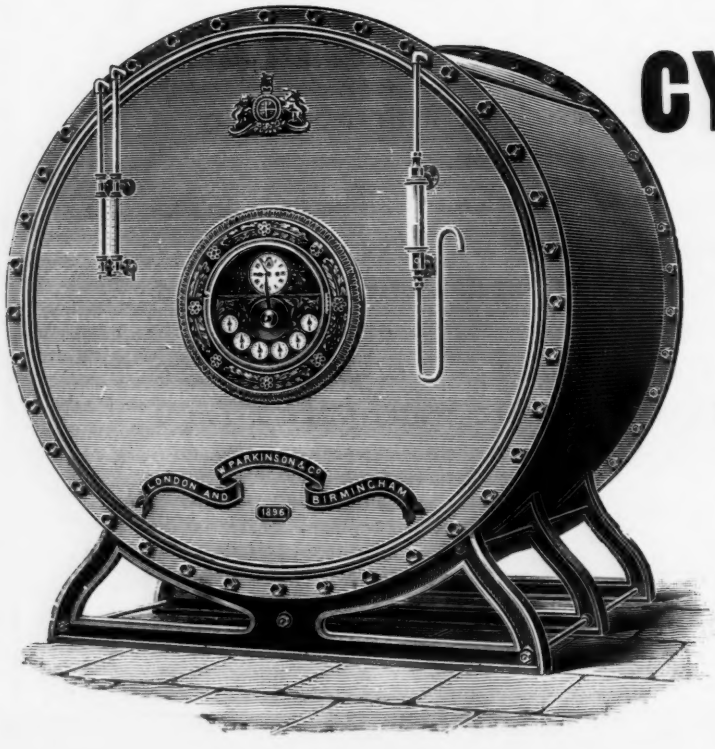

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INSURANCE—H. F. LAMSDEN, Insurance Broker (Established 1888), 19 & 21, Queen Victoria Street, London, E.C., quotes BOTTOM LONDON RATES FOR EMPLOYERS' LIABILITY UNDER THE NEW ACT. Collective Fidelity Guarantee and THIRD PARTY, INCLUDING DAMAGE CAUSED BY GAS EXPLOSION, Marine, Fire, and Loss of Profit in case of Fire. Motor-Car, Boilers, Engines, Lifts, Cranes, all classes of Machinery, and Plant. Payment of Trade Acceptances and Open Credits Guaranteed. Excess Bad Debt Policies fixed on the most favourable Terms.

GENTLEMAN with Six Years' Practical Experience of the Gas-Stove Trade throughout, Technical and Commercial; also with good Inventive Ability and capable of holding position of General Manager's Assistant, or Show-Room and Advertising Manager, or other leading position, desires ENGAGEMENT. Excellent Credentials, and would invest £500 in sound Firm.
Address No. 4960, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

CITY AND GUILDS.
CLASSES in Gas Engineering, Gas Supply, Chemistry, &c.
Correspondence College Company, 26, Green Street, Cambridge.

MR. Arthur L. Griffith, of No. 46, Queen Victoria Street, E.C., Secretary of the Society of British Gas Industries, is open to UNDERTAKE the SECRETARYSHIP of One or Two small Companies. Experience in Gas Companies' Accounts. Central Office, with Board Room.

DRAUGHTSMAN, Experienced in the Design and Erection of Gas-Works Buildings, Machinery, Manufacturing and Distribution Plant, &c., is OPEN to ENGAGEMENT. Excellent References.
Address A.K., care of Street's, 30, Cornhill, E.C.

TRAVELLER, with several Years' Experience and Connection among Gas Companies, desires to hear from an Established Firm.
Address No. 4958, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, by Advertiser (Relinquishing Business) Situation as GAS-FITTER (Compo. or Iron Pipe), Meter Indices, Gas Cooker Repairs, (own Tools if required). Can do Book-Keeping and get out Estimates.
Address "Gas-Fitter," 7, Carnarvon Road, Boscombe, Hants.

WANTED, Second-Hand Bridge-Pipes for Retort-Bench, 5-inch Diameter, Flanged, N Pattern.
Particulars to Mr. Henry Tobey, Gas-Works, Malton.

WANTED, a First-Class Agent for a Belgian Manufacturer of Incandescent Mantles. One who is well introduced with Gas-Fitters in the United Kingdom.
Address "B. A. 1780," Agence Havas, Brussels.

BOROUGH OF NELSON.
SALE OF GAS-WORKS PLANT.

THE Gas Department, having taken over the Supply of Gas to an adjoining village, have FOR SALE A COMPLETE GAS-WORKS PLANT (Eighteen Single Retorts).
Full Particulars of the whole or any portion of the Plant may be obtained on Application to Mr. A. J. Hope, Engineer, Gas Offices, Nelson.

TO WATER ENGINEERS.
FOR SALE—New Sand Washing EJECTOR BOXES, 4 ft. by 3 ft. by 2 ft. 6 in., with 3 inch Sluice Valve, ¾ inch Cock and Pipe Connections. Guaranteed Perfect. Made to Engineers Specification for important Water-Works in excess of requirements. Price over 30 per cent. less than cost, delivered. Every Investigation courted and Information willingly given.
Address No. 4959, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS PLANT FOR SALE.
THE Hastings and St. Leonards Gas Company have still some useful SURPLUS PLANT for Disposal, which is well worth the attention of anyone requiring such.
This Plant (including Retort-House Fittings, Purifiers, Exhausters, Washers, Meters, Girders, Connections, &c., Particulars of which will be furnished on Application) is suitable for Works up to 1½ Millions per diem capacity, and is only out of use owing to the new Glyne Gap Works.
Chas. E. Botley, M.Inst.C.E.,
Engineer and General Manager.

WE have the following New and Overhauled Second-Hand PLANT FOR SALE:—
Gasholder, 8500 cubic feet, New Steel Tank.
Gasholders, 35 ft. by 10 ft., Cast-Iron Tank.
" 45 ft. by 12 ft.
" 50 ft. by 15 ft. 4 in., Telescopic.
Overhauled and re-erected in new Steel Tanks.
8-inch, 9-inch and 10-inch Condensers.
New "Cripps's" Washer, 8-inch Connections, 200,000 cubic feet per day.
Walker's Purifying Machine.
Exhausters and Engines, Single and Combined, 2000 to 60,000 feet per hour.
Scrubber, 7 ft. diameter, 55 ft. high.
Purifiers, sets 6-fts., 10-fts., 12-fts., and 20-fts.
Plans and Quotations of new Sets.
6-inch to 18-inch Station Meters, Governors, &c.
New Drums.
Tar and Liquor Pumps.
Producer-Gas Plants for 150 to 300 H.P.
Boilers, Tanks, and all requisites for Gas-Works.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury (Yorks.)

CORPORATION OF LOUGHBOROUGH.
(Gas Department.)
TENDERS FOR COAL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply of the whole or part of 9000 Tons of Unscreened GAS COAL or NUTS, to be delivered at Loughborough Station at such times and in such quantities as may be required during the Year from the 1st of August, 1908, to the 30th of July, 1909.
Tenders to be addressed and delivered to H. Perkins, Esq., Town Clerk, Town Hall, Loughborough, not later than Thursday, the 9th of July, 1908.
The Committee do not bind themselves to accept the lowest or any Tender, and reserve themselves the power to accept a portion of a Tender.
By order,
Edward Onions,
June 24, 1908. Engineer and Manager.

TO THE INCANDESCENT GAS TRADE.
TENDERS to Purchase are invited, by order of the Court, for some 688 Cases of GLASSWARE—CHIMNEYS, SHADES, AND GLOBES—(Chemnitz & Penzig chiefly) suitable for Incandescent Gaslight Fittings, as formerly supplied by Block Light Limited, all lying in London Warehouses.
Full Particulars and order to view can be obtained from the undersigned.
The Receiver does not bind himself to accept the highest or any Tender.
R. B. Petre, Receiver and Manager, Block Light Limited (in Liquidation), 11, Ironmonger Lane, E.C.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the Supply and Erection of a 20-Ton Motor Lorry WEIGHBRIDGE at their Bloom Street Works.
Full Particulars may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Weighbridge," to be delivered to me not later than Three p.m. on Wednesday, the 8th of July, 1908.
L. C. Evans,
Town Clerk.
Town Hall, Salford,
June 24, 1908.

BOROUGH OF BARROW-IN-FURNESS.
SUPPLY OF COAL.

THE Corporation are prepared to receive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the Supply of Screened GAS COAL, up to the 30th of June, 1909.
Tenders, addressed to the "Chairman of the Gas and Water Committee," and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office not later than Twelve o'clock noon on Friday, the 3rd of July 1908.
The lowest or any Tender not necessarily accepted.
By order,
L. Hewlett,
Town Clerk.
Town Hall, Barrow-in-Furness.

BOROUGH OF NEWCASTLE-UNDER-LYME.
(Gas Department.)
GAS FUEL.

THE Gas Committee invite Tenders for the Supply and Delivery of 10,000 Tons of GAS FUEL during the Twelve Months ending July 30, 1909.
Forms of Tender may be had from the undersigned.
Tenders to be sent to the Town Clerk on or before July 17, 1908.
The Committee do not bind themselves to accept any Tender.
E. P. Baskeyfield,
Manager and Secretary.

NEWCASTLE-UNDER-LYME CORPORATION.
(Gas Department.)

THE Gas Committee of this Corporation are prepared to receive TENDERS for the Purchase of their Surplus COKE produced at these Works for Twelve Months ending June 30, 1909.
Tenders, endorsed "Coke," to be sent to the Town Clerk on or before July 17, 1908.
The Gas Committee do not bind themselves to accept the highest or any Tender.

NEWCASTLE-UNDER-LYME CORPORATION.
(Gas Department.)

THE Gas Committee of this Corporation are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR produced at these Works for Twelve Months ending June 30, 1909.
Tenders, endorsed "Tar and Liquor," to be sent to the Town Clerk on or before July 17, 1908.
The Gas Committee do not bind themselves to accept the highest or any Tender.
The Tar and Liquor to be taken in boats.

THE Corporation of Middleton are prepared to receive TENDERS for the COAL and CANNEL required at their Gas-Works.
Further Particulars and Form of Tender, which will include a Fair-Wages Clause, may be obtained from Mr. C. F. Broadhead, Gas Engineer.
Tenders, addressed to the Chairman of the Gas Committee, endorsed "Tender for Coal," or "Cannel," as the case may be, must be delivered at my Office not later than Saturday, July 18, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender.
Frederick Entwistle,
Town Clerk.
Town Hall, Middleton,
June 24, 1908.

BOROUGH OF LEIGH.
(Gas and Water Departments.)

THE Gas and Water Committee of the above Corporation are prepared to receive TENDERS for the Supply of about 13,000 Tons of Screened and Unscreened GAS COAL, NUTS, and SLACK.
Forms of Tender may be had on Application from the undersigned to whom all Inquiries must be addressed; and all Offers must be made on the Official Forms, or they will not be considered.
Sealed and endorsed Tenders must be delivered to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancashire, on or before Twelve o'clock noon, on Friday, the 17th day of July, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to divide any Tender.
James Gibson,
Engineer and Manager.
Gas and Water Offices, Leigh,
Lancashire, June 25, 1908.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Supply of 13,000 Tons of COAL.

Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.

Sealed Tenders, endorsed "Coal," to be sent to me not later than Saturday, July 11, 1908.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 24, 1908.

NORTHWICH GAS COMPANY.

THE Directors of the Northwich Gas Company invite TENDERS for the Supply of about 7000 Tons of GAS COAL during the Year ending June 30, 1909.

Full Particulars, and Printed Forms of Tender, may be had on Application to the undersigned.

Tenders, endorsed "Coal," are to be sent in addressed to the Chairman by Thursday, July 9, 1908.

SAML. S. MELLOR,
Manager and Secretary.

Gas-Works, Northwich,
June 22, 1908.

BOROUGH OF EAST RETFORD.

TENDERS FOR GAS COAL.

THE Gas Committee of the above are open to receive TENDERS for the Supply of 6500 Tons of Freshly Worked Screened GAS COAL or NUTS to be delivered during the Twelve Months ending June 30, 1909, as may be required.

Forms of Tender and any further Particulars may be had on Application to the undersigned.

Tenders to be sent in addressed to the Chairman of the Gas Committee, endorsed "Tender for Gas Coal," on or before July 4, 1908.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
East Retford, June 20, 1908.

LITTLEBOROUGH GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the Supply of 3500 Tons of Best Screened GAS COAL, and 2000 Tons of GAS SLACK, to be delivered at Littleborough Station (Lancashire and Yorkshire Railway) in quantities as required during the period from Aug. 1, 1908, to June 30, 1909.

TENDERS FOR TAR.

Tenders are also invited for the Surplus TAR produced at these works from Aug. 1, 1908, to July 31, 1909, delivered in Contractor's Tanks at Littleborough Station (Lancashire and Yorkshire Railway).

Quantity, about 400 Tons.

Tenders, endorsed "Coal," and "Tar," respectively should be sent to the undersigned not later than July 18, 1908.

The Directors do not bind themselves to accept any Tender.

S. E. HALLIWELL,
Manager and Secretary.

Gas-Works, Littleborough,
June 26, 1908.

BOROUGH OF TODMORDEN.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the Supply of 12,000 Tons of Screened or Unscreened GAS COAL and 1500 Tons of CANNEL, to be delivered over the ensuing Twelve Months, in such Quantities and at such times as may be required by the Gas Engineer.

Further Particulars and Forms of Tender may be obtained on Application to the undersigned.

Sealed and endorsed Tenders to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, on or before July 16, 1908.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
H. TALBOT,
Engineer.

Gas-Works, Todmorden,
June 24, 1908.

URBAN DISTRICT COUNCIL OF OLDBURY.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council are prepared to receive TENDERS for the Supply of 12,000 Tons of Best Screened GAS COAL for Delivery during the Year ending July 31, 1909, in such quantities and at such times as ordered carriage free to (1) Oldbury Basin (Great Western Railway), (2) London and North Western Railway, Bromford Lane, Oldbury, and (3) London and North Western Railway, Spon Lane Basin.

The Coal must be of First-Class quality, well Screened, Freshly Wrought, and Perfectly free from Bats, Pyrites, and other foreign matter.

Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Gas Coal," must be delivered to the undersigned not later than Saturday, July 11, 1908.

The Gas Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to Apportion the whole Quantity, or part thereof, as they may think fit.

Tender Forms and any further Information may be obtained from the undersigned.

By order,
A. COOKE,
General Manager.

Gas-Works, Oldbury
June 27, 1908

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the Supply of about 90,000 Tons of COAL for the Nine Months commencing the 1st of September, 1908.

Specifications and Forms of Tender can be obtained on Application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, July 14, 1908.

J. H. HALLSWORTH,
Town Clerk.

Oldham, June 18, 1908.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate TO CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m., on Tuesday, the 7th day of July next, and WILL BE RE-OPENED immediately after the HALF-YEARLY ORDINARY GENERAL MEETING of the Company to be held on Friday, the 7th day of August next.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., June 25, 1908.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

NOTICE is Hereby Given, that an EXTRAORDINARY GENERAL MEETING of the Proprietors of this Association will be held on Wednesday, the 15th of July, 1908, at One o'clock p.m., precisely, at the City Terminus Hotel, Cannon Street, London, E.C., when the following Resolution will be submitted for the consideration and approval of the Proprietors, viz.:—

"That the Directors be, and they are hereby, authorized to borrow a sum of £761,400 on Mortgage, Debenture, or Debenture Stock, in accordance with the provisions of the Imperial Continental Gas Association Act, 1893, on such Terms and Conditions, and at such time or times, as they may think best in the Interest of the Association."

By order of the Board,
ROBERT W. WILSON,
Secretary.

Offices: 21, Austin Friars,
London, E.C., June, 26, 1908.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 14th day of July next, at 2.30 p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are E. F. White, Esq., and N. E. B. Garey, Esq., and the retiring Auditors are J. Reeson, Esq., and A. T. Eastman, Esq., who, being eligible for re-election, offer themselves accordingly.

The Accounts to be submitted to the Shareholders will be open for inspection at the Company's Offices on and after the 10th of July next.

Notice is Also Given, that the TRANSFER BOOKS WILL BE CLOSED from the 14th to the 31st of July next, both days inclusive.

By order of the Board,
W. WILLIAMS,
Secretary and General Manager.

Finsbury House, Blomfield Street,
London, E.C., June 26, 1908.

In accordance with Clause 12 of the Company's regulations:—

"The Bearer of a Share Warrant may, on depositing his Warrant at the Chief Office of the Company in London not later than 48 hours before holding any Meeting of the Company, be present and vote at any such Meeting in respect of the Shares or Stock included in such Warrant."

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

UXBRIDGE GAS COMPANY.

NEW ISSUE OF £8800 CONSOLIDATED STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

MR. W. SUDLOW HERRICK, F.A.I., is favoured with Instructions from the Directors of the Company to SELL BY AUCTION, at the Mitre Hotel, Hampton Court, on July 16, at Five o'clock precisely,

£5000 CONSOLIDATED ORDINARY STOCK
AND
£4000 FOUR PER CENT. PERPETUAL DEBENTURES
IN THE
HAMPTON COURT GAS COMPANY.

Particulars and Conditions of Sale may be obtained of WM. C. LAMB, Esq., Gas Offices, HAMPTON WICK; at the PLACE OF SALE; and of the AUCTIONEER, 90, Eden Street, KINGSTON-ON-THAMES. Tel. 261 P.O. Kingston.

Testing Instruments.

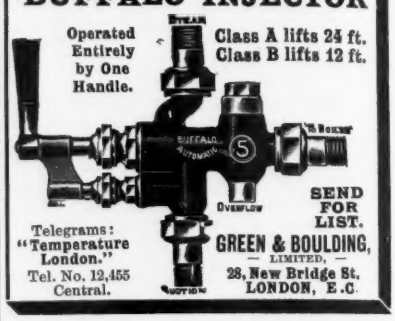
ALEXANDER WRIGHT & CO., LD.,
WESTMINSTER.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

'BUFFALO' INJECTOR



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LUX'S GAS-BALANCE.
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BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: H. CRESSWELL & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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Strong diffusive White Light.
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STATION METER.
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APPLY—
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SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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Highest Results in Gas, & Excellent Coke.
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RUSCOE
Repair fractured Pipes and weak Socket Joints with
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A Permanent Cure, quickly fixed at little cost.
ESPECIALLY INVALUABLE IN CASES OF EMERGENCY.
A. O. RUSCOE,
2, QUEEN ANNE'S CHAMBERS, WESTMINSTER, S.W.

MIRFIELD GAS COAL.
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Please apply for Price, Analyses, and Report, to the
MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

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The very best Patent Grid on the Market for Holding Oxide Lightly.
Send for Catalogue with Illustrations and Particulars to WALTER SPENCER, Grid-Works, ELLAND, YORKS.

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MANUFACTURERS OF
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HIGHEST EFFICIENCY FOR
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"Altogether I am delighted with the plant, and we are saving somewhere about £300 per Annum on our total make of Coal Gas and Water Gas of 45,000,000 cubic feet per Year.

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25, Victoria Street, Westminster, London, S.W.

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WILSON CARTER & PEARSON,
LIMITED.
Gas, Steam, and other Fuel for Home and Export.
GAS COKE CONTRACTORS.
CHIEF OFFICES:
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Stoking Machinery
HYDRAULIC COKE PUSHERS
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WILL DISCHARGE A RETORT IN ONE OPERATION
LARGE NUMBERS IN USE.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, June 9, p. 670.]

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MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

MODERN METHODS OF
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By C. E. BRACKENBURY, Assoc.M.Inst.C.E.,
Barrister-at-Law.
Being a Reprint of Six Articles contributed to the "Engineering Times."

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RETORT SETTINGS
THE VERY BEST IN EXISTENCE.
NONE OTHER TO EQUAL THEM.
R. & G. HISLOP,
Retort Builders and Contractors,
UNDERWOOD HOUSE, PAISLEY.
Dacre House, Victoria Street, LONDON, S.W.

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Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.
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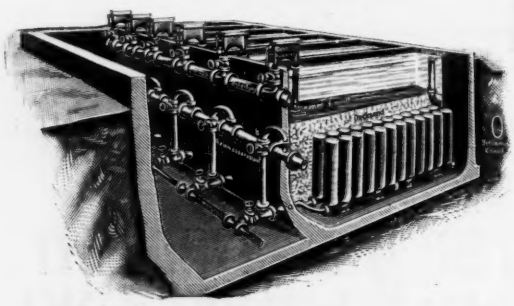
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone: No. 200.
LONDON DISTRICT OFFICE *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.* Telegraphic Address: "PARKER, LONDON."



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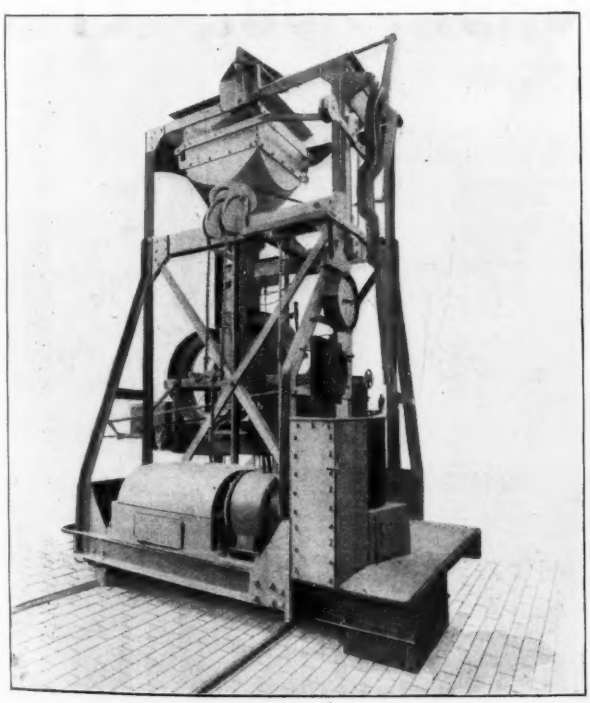

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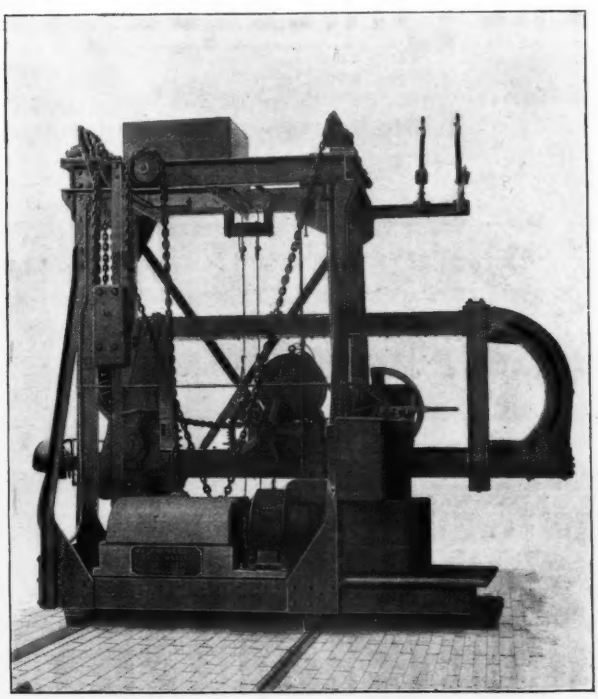

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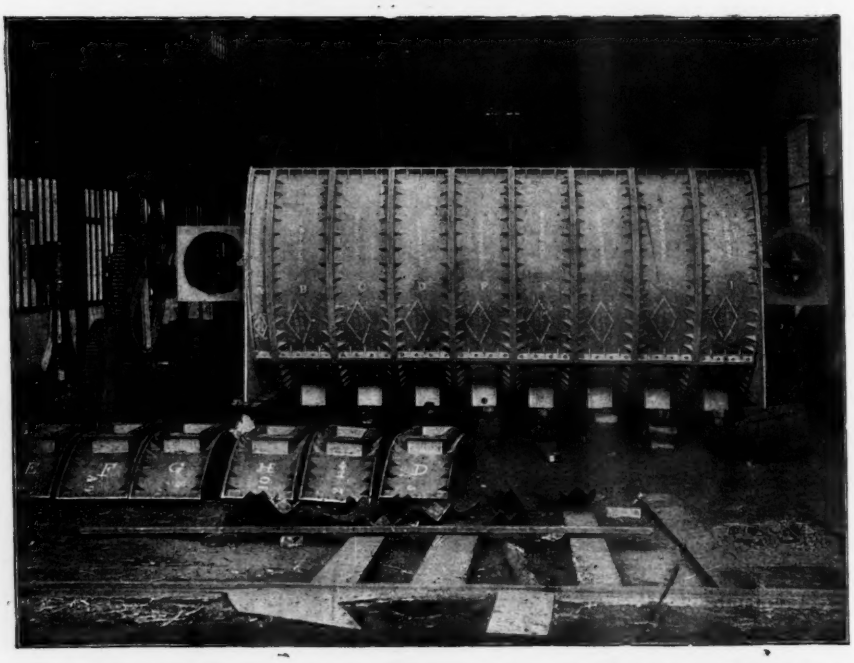

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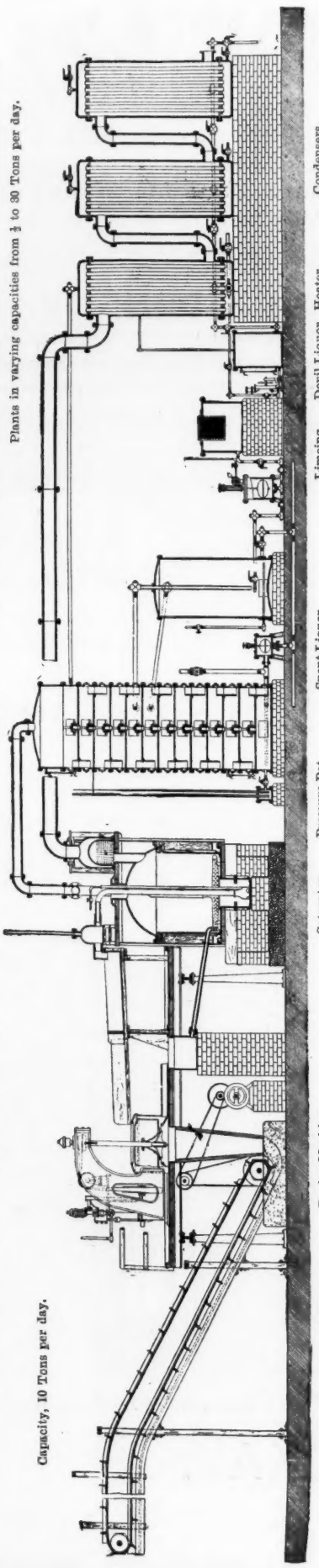

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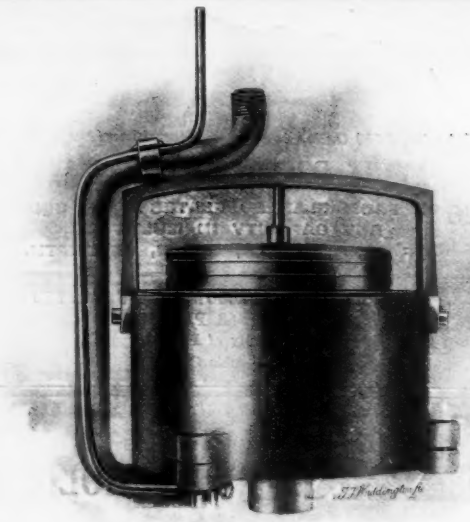

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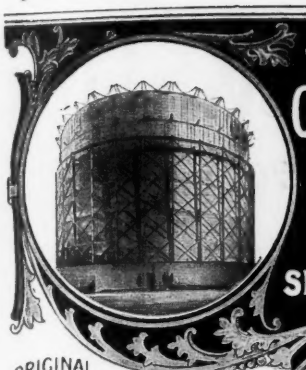

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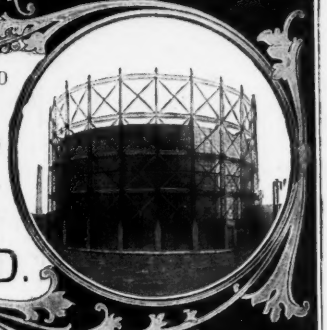

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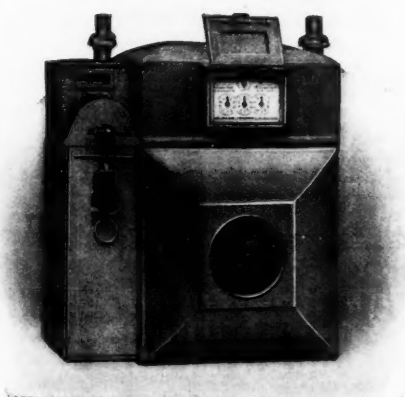

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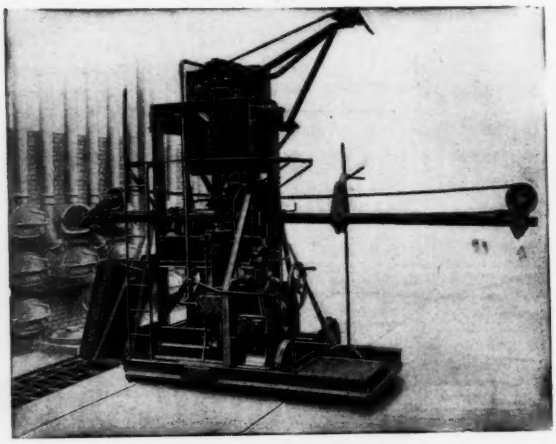

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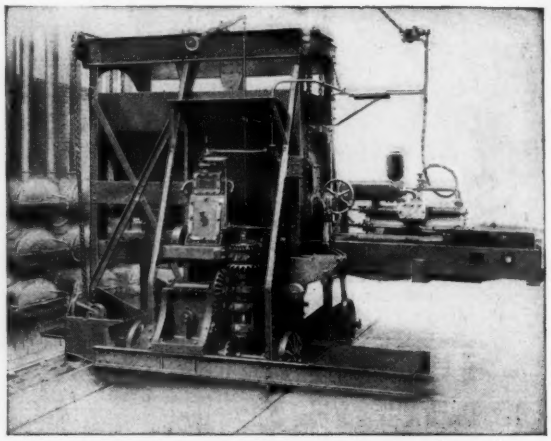

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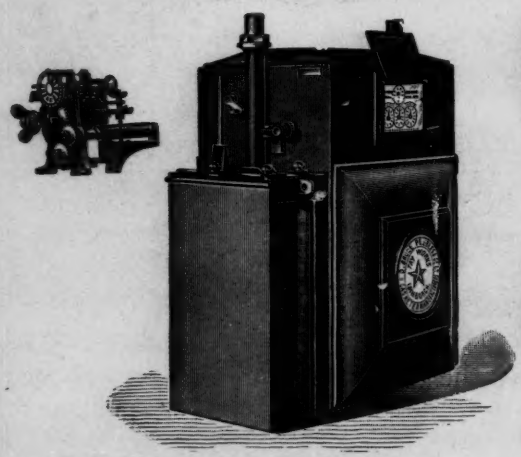

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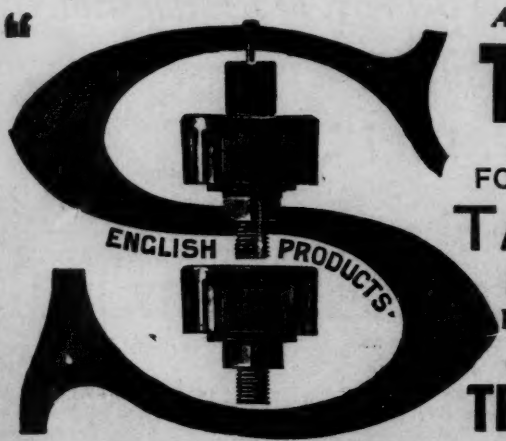

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